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SITE INSPECTION REPORT FOR FMC/SIMPLOT POCATELLO, IDAHO

TDD F10-8702-09/10

Report Prepared by: Ecology and Environment, Inc.
Date: April 1988

Submitted to: J.E. Osborn, Regional Project Officer
Field Operations and Technical Support Branch
U.S. Environmental Protection Agency
Region X
Seattle, Washington

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DISCLAIMER

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SITE INSPECTION REPORT
FMC/SIMPLOT
POCATELLO, IDAHO
TDD F10-8702-09/10

Site Name/Address

FMC Corporation
Phosphorous Chemicals Division
Box 4111
Pocatello, Idaho 83202

and

J.R. Simplot Company
Box 912
Pocatello, Idaho 83204

Investigation Participants

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Principal Site Contacts

Marc Bowman, Supervisor, FMC Corporation, Pocatello, Idaho (208) 236-8212
John Cochrane, Superintendent, J.R. Simplot Company, Pocatello, Idaho (208) 232-6620

Dates of Investigations

March 19 and 26, 1987	0800 - 1730 hours
August 24-September 4, 1987	0730 - 1830 hours

Dates of Sampling

August 31-September 4, 1987	Soil, sediment, surface water, ground water, and waste samples.

ecology and environment, inc.
101 YESLER WAY, SEATTLE, WASHINGTON, 98104, TEL. 206/624-9537
International Specialists in the Environment

MEMORANDUM

DATE: May 3, 1988

TO: John Osborn, FIT-RPO, USEPA, Region X

THRU: Jeffrey Villnow, FIT-OM, E&E, Seattle

FROM: Karl A. Morgenstern, FIT-SM, E&E, Seattle KAM

SUBJ: Site Investigation Recommendations
FMC/Simplot
Pocatello, Idaho

REF: TDD F10-8702-09/10

CC: Deborah Flood, HWD-SM, USEPA, Region X
George Brooks, FIT-PM, E&E, Seattle
Thomas Tobin, E&E, Seattle

Based on the results of the site inspection, E&E recommends that additional shallow monitoring wells be installed in the upper aquifer to intersect the potential plume identified in the geophysical surveys and monitor ground water quality downgradient of the FMC unlined waste ponds. One shallow well should be installed upgradient of the FMC facility because none exist at this time.

The current unlined waste ponds at FMC should be phased out of service and replaced by lined ponds. The former waste ponds (including ponds 1E, 4E, and 9S) should be properly closed.

Consideration should be given to éliminating the FMC production well #1 as a source by employee drinking water due to elevated level of cadmium above Primary EPA Drinking Water Standards. An air monitoring program may also be necessary to assess the potential environmental impact of wind-blown particles and source emissions of various hazardous substances.

KAM:ilt

Enclosures

ABSTRACT

Under U.S. Environmental Protection Agency (EPA) Technical Directive Document (TDD) Numbers F10-8702-09/10, Ecology and Environment, Inc. (E&E) conducted file reviews and site inspections of the FMC and J.R. Simplot facilities, two phosphate processing plants located west of Pocatello, Idaho. Past data indicated elevated levels of arsenic and other metals in the ground water downgradient of the facilities. E&E's inspections consisted of 1) geophysical surveys using electromagnetic (EM) conductivity to delineate potential ground water contaminant plumes; and 2) collection of 24 ground water, one spring, 14 waste pond water, 13 waste pond sediment, two waste pile, and two soil samples. The analytical data and EM survey results were used to preliminarily determine the extent of ground water contamination and to identify potential contaminant sources at one or both facilities. The ground water data indicated elevated levels (i.e., concentrations greater than 10 times background or three times the respective analytical detection limits) of arsenic and other metals in both the upper and lower aquifers. EM survey results delineated a potential contaminant plume migrating northeast in the unconfined aquifer. It appears from the analytical data and EM results that the ground water contamination is concentrated in the northeast area of the FMC facility and that unlined ponds located in the northeast portion of the FMC Site are the probable source of ground water contamination. The sediment of the unlined ponds contained elevated levels of arsenic, cadmium, chloride, chromium, copper, fluoride, lead, potassium, selenium, silica, vanadium, and zinc. Sediment in the J.R. Simplot waste ponds contained elevated levels of fluoride, chloride, selenium, sodium, and silica.

1.0 INTRODUCTION

Pursuant to U.S. Environmental Protection Agency (EPA) Contract Number 68-01-7347 and Technical Directive Document (TDD) Numbers F10-8702-09 and F10-8702-10, Ecology and Environment, Inc. (E&E) conducted Site Inspections (SIs) of the FMC Corporation (FMC) and J.R. Simplot Company (Simplot), two phosphate processing plants located west of Pocatello, Idaho (Figure 1). Due to the proximity and similarity of the sites, the inspections were managed as a single project.

The FMC facility extracts elemental phosphorus from shale ore and stores the element before being shipped for use at other facilities. The Simplot facility, located adjacent to and west of the FMC facility, produces a variety of fertilizer products from phosphate ore. Past data indicate elevated levels of arsenic and other metals in the ground water downgradient of the facilities. As a result, Site Inspections were requested to focus on identification of possible contaminant sources and verification of ground water quality downgradient of the two facilities.

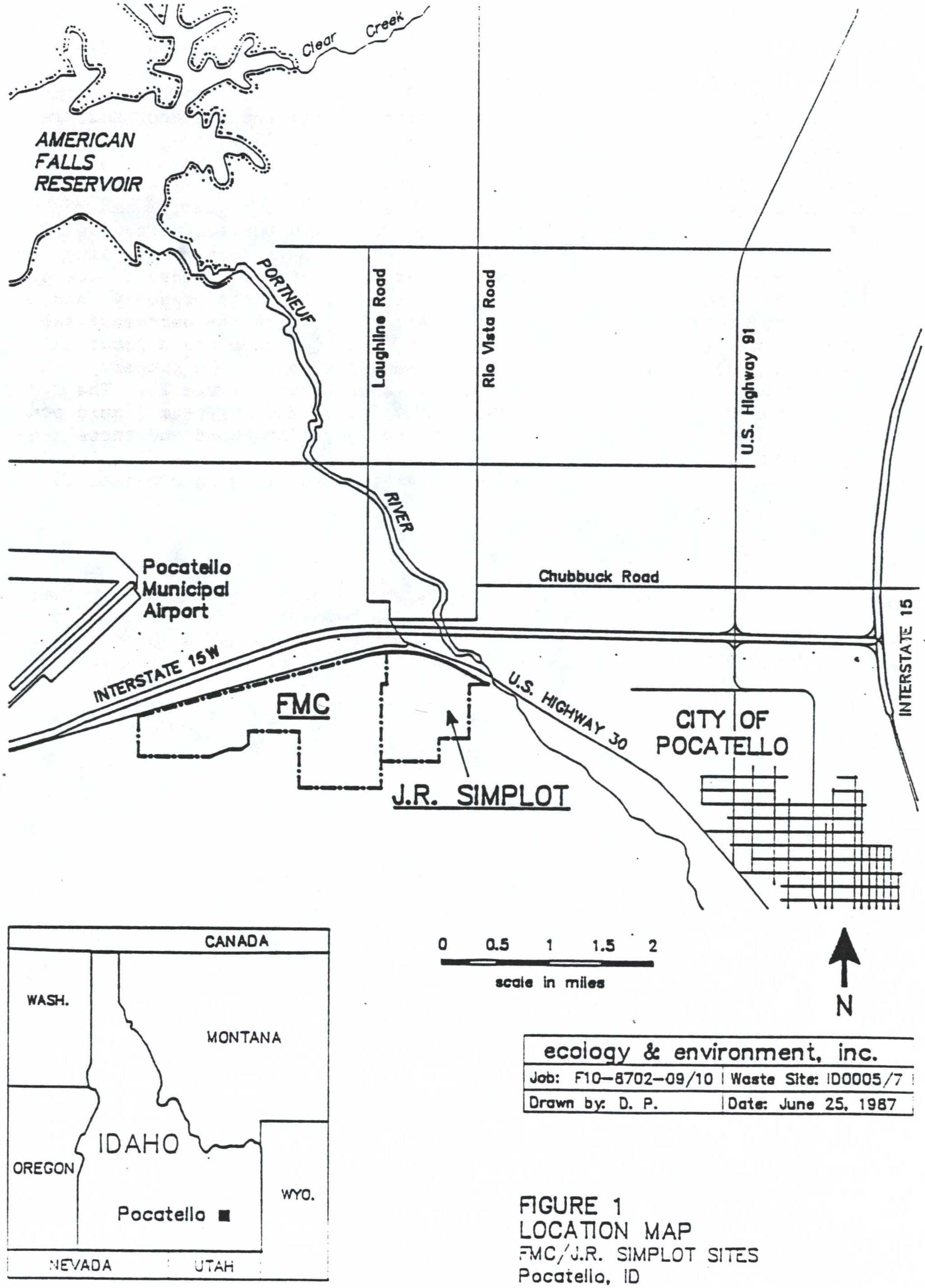
A Site Inspection represents the last phase of a three-step process utilized by EPA to identify and rank actual or potential public health and environmental threats associated with a particular site relative to other sites across the nation. The SI specifically is intended to gather sufficient data, supplemental to that gathered during Site Discovery and Preliminary Assessment activities, to prioritize sites for additional work and guide decision makers in ascertaining the scope of such work. The SI is not intended to provide complete environmental characterization of a site.

Activities conducted during the FMC/Simplot Site Inspections included an initial reconnaissance of each site, collection and review of available background data, development of field operations work plans, and collection of samples. This document summarizes the results of the investigative process. Information pertaining to the environmental setting, waste characteristics, and operations of each site is presented as are data developed during field sampling.

2.0 ENVIRONMENTAL SETTING

2.1 Location and Description

The FMC/Simplot Sites are located on the eastern Snake River Plain in Power County, Idaho, approximately two miles west of Pocatello, Idaho (Figure 1). The two phosphate processing plants lie at the base of a hill overlooking the Portneuf River, approximately one quarter mile to the northeast. They occupy the north 1/2 of Sections 13 and 18, the south 1/2 of Section 7, and the southeast 1/4 of Section 12; Township 6S, Range 33E. The coordinates of the two facilities are approximately 42° 54′ 34″ north latitude and 112° 31′ 21″ west longitude (1).



ecology & environment, inc.	
Job: F10-8702-09/10	Waste Site: ID0005/7
Drawn by: D. P.	Date: June 25, 1987

FIGURE 1
LOCATION MAP
FMC/J.R. SIMPLOT SITES
Pocatello, ID

Elevations in the vicinity of the two facilities range from approximately 5,680 feet above mean sea level (AMSL) in the hills to the south, to 4,600 feet AMSL at the sites, and 4,400 feet AMSL in the Portneuf River Floodplain. The terrain slope and surface drainage of the two facilities is to the north-northwest (1).

The general layouts of the two facilities are similar with the plant areas located along the north side of the property, and the waste ponds and waste piles located in the southern portion of the sites (Figure 2). The FMC property contains 18 waste ponds, including the precipitator slurry and phossy water ponds in the southwest part of the site, the calciner ponds along the east side of the property, and the slag pond, cooling pond, and rainwater lagoon in the northeast section of the facility (Figure 2). The FMC facility also has a landfill and two slag piles located in the southern portion of the property, and a ferrophos pile north of the phossy water ponds (Figure 2). The J.R. Simplot facility contains two gypsum stacks and a gypsum liquid pond in the southern half of the property, and a cooling pond and three treatment ponds in the northeast portion of the site (Figure 2). Further detail on the various waste ponds at the two sites is provided in Section 3.0 (2).

2.2 Soils and Geology

The facilities in the study area are directly underlain by silt loam soils to a depth of approximately three to five feet below ground surface (bgs) (3). The permeability of these soils has been measured to range from 0.6 to 2.0 inches/hour (3). The soil pH reportedly ranges from 7.9 to 8.4 (3).

The geology of the study area has been influenced by a variety of volcanic, tectonic, and alluvial processes (4). The FMC and Simplot Sites are located at the southern boundary of the Michaud Flats area at the base of the Bannock Mountain Range. Table 1 summarizes the reported stratigraphy beneath the study area (1), and describes the major geologic and hydrogeologic characteristics associated with these units (4, 5).

The massive rhyolitic tuffs of the Tertiary age Starlight Formation are the oldest rocks penetrated by wells in the study area. Unconformably overlying the Starlight Formation are a series of sedimentary and volcanic units of Quaternary age (4). These units include the fine-grained deposits of the American Falls Formation, which reportedly acts as a confining layer to ground water in older units in the Michaud Flats area (4). Figures 3 and 4 illustrate cross sections of the generalized geology beneath the study area, as interpreted from available local well logs (6, 7, 8).

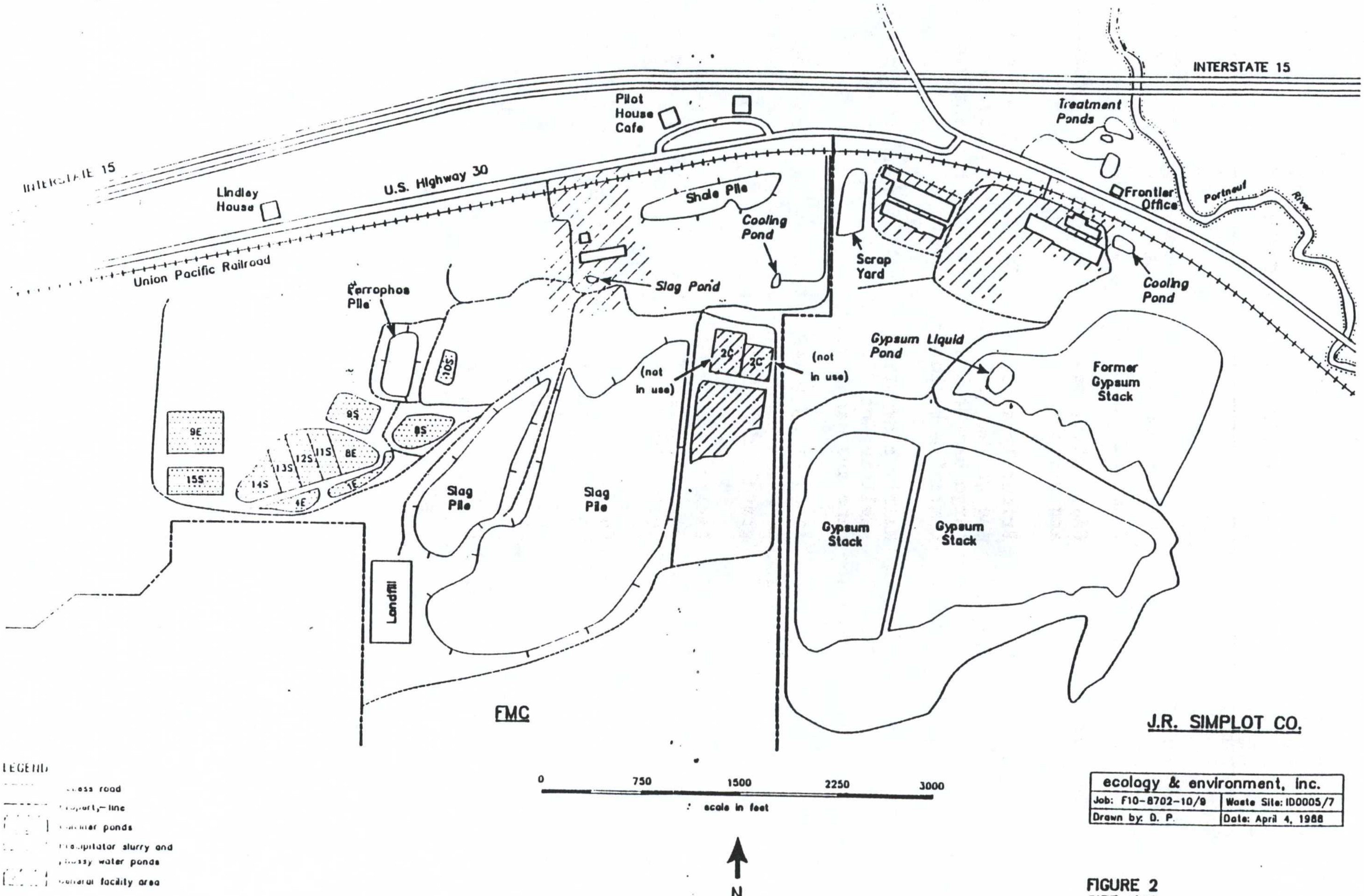


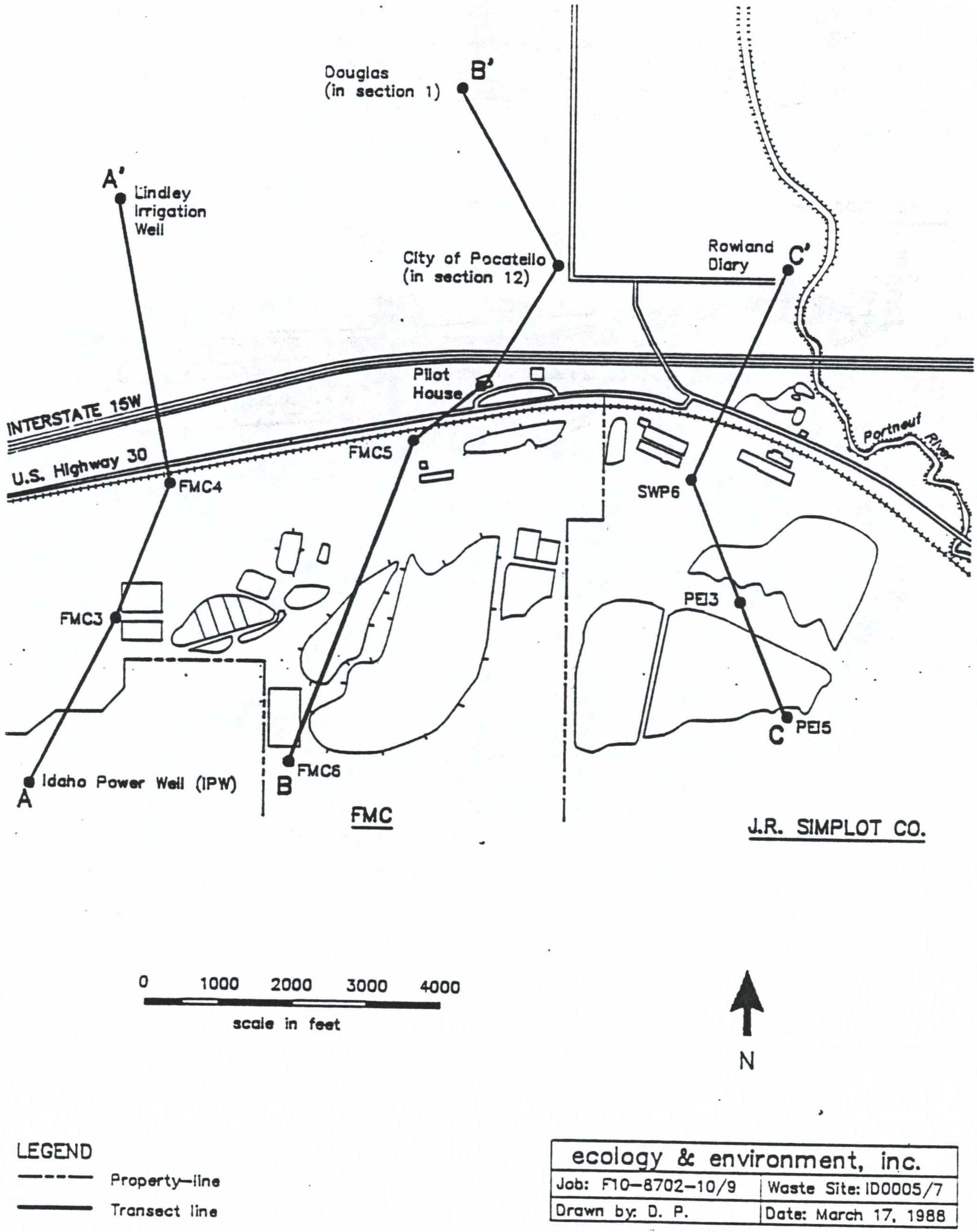
FIGURE 2
SITE MAP
FMC/J.R. SIMPLOT SITES
Pocatello, ID

TABLE 1

GEOLOGIC UNITS BENEATH FMC/SIMPLOT

Geologic Age	Strati-graphic Unit	Description	Thickness Range (ft)	Hydrogeologic Unit
Quaternary	Alluvium	Clay, silt, sand, and gravel	0-36	Unsaturated Zone
	Michaud Gravel	Primarily sand and gravel with large basalt and quartzite boulders	5-102	Upper unconfined Aquifer (vari-able yields)
	American Falls Formation	Mainly clay with small amounts of sand and sandy silt	10-125	Confining layer to deeper aqui-fers
	Sunbeam Formation	Alluvial/colluvial deposits of sand, gravel, and silt	75-234	Confined Aquifer (low yields)
	Big Hole Basalt	Basalt (not present in all wells	71+	Confined Aquifer (high yields)
	Pediment Gravel	Quartzite, lime-stone and dolo-mite pebbles, cobbles, and boulders	65-258	Confined Aquifer (high yields)
Tertiary	Starlight Formation	Massive rhyolite tuff	75+	Confined Aquifer (variable yields)

Source: Ref. 2, 6, 7, 8



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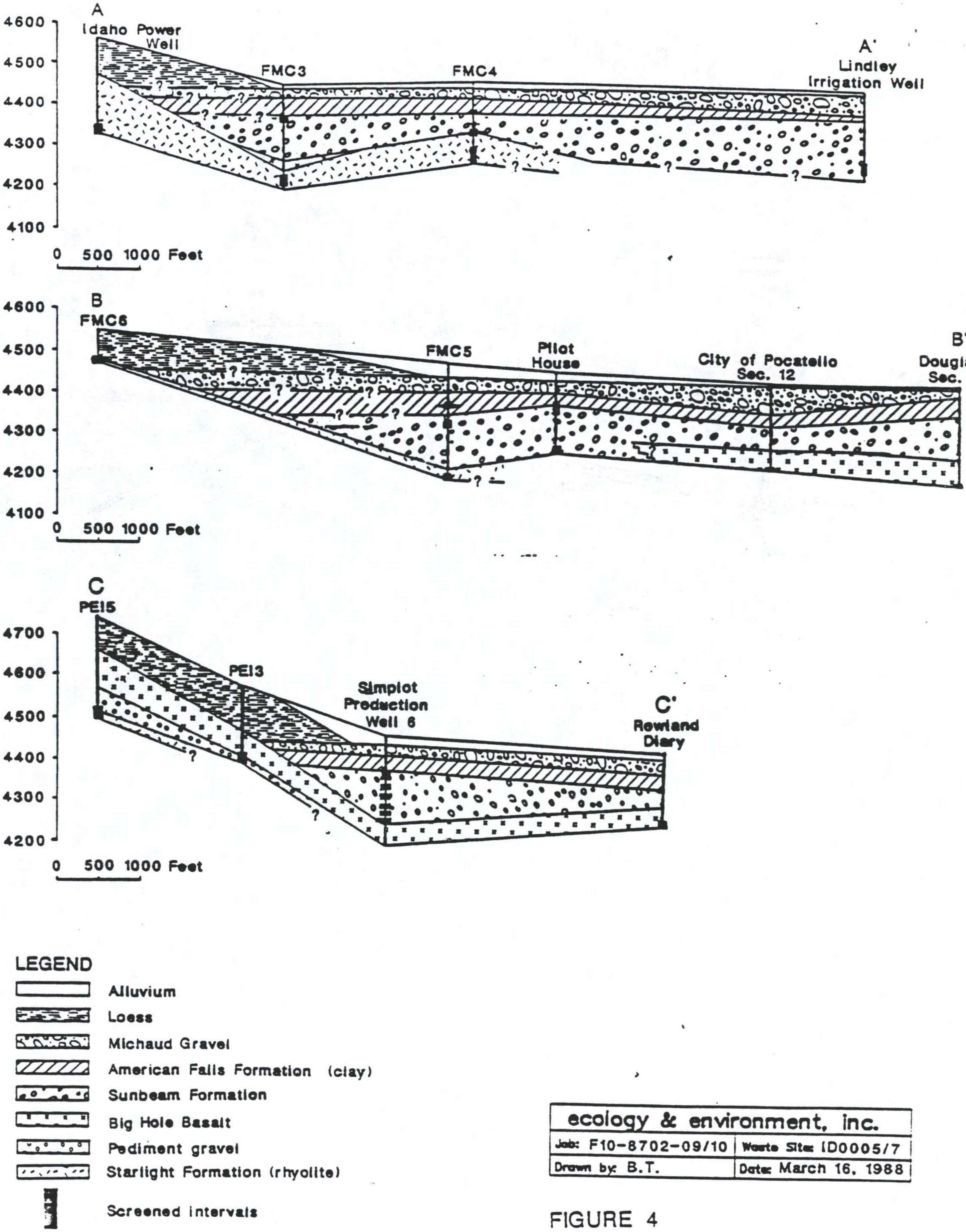
Job: F10—8702—10/9	Waste Site: ID0005/7
Drawn by: D. P.	Date: March 17, 1988

FIGURE 3
GEOLOGIC CROSS SECTION
TRANSECT LINE LOCATIONS
FMC/J.R. SIMPLOT SITES
Pocatello, ID



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Job: F10-8702-09/10	Waste Site: ID0005/7
Drawn by: B.T.	Date: March 16, 1988

FIGURE 4
INTERPRETIVE GEOLOGIC CROSS SECTION DIAGRAM
FMC/J.R. SIMPLOT SITES
Pocatello, ID

Loess deposits occupy the transitional slope between the mountains and the lowlands (Figure 4). A significant proportion of the FMC and Simplot properties south of the process areas are, therefore, underlain by silt sized material. The geologic logs from wells in the study area indicate that most of the Michaud Flats deposits, including the American Falls Formation, are not present in wells on the northern flank of the Bannock Mountains (6, 7, 8) (Figure 4). As a result, the loess deposits are brought into unconformable contact with the older volcanic units in this area. This contact is located upgradient of the FMC and Simplot process areas. The location of this contact with respect to the FMC and Simplot waste storage areas is not well delineated. Ground water present in the subsurface south of this contact is presumably unconfined, due to the absence of the American Falls clays.

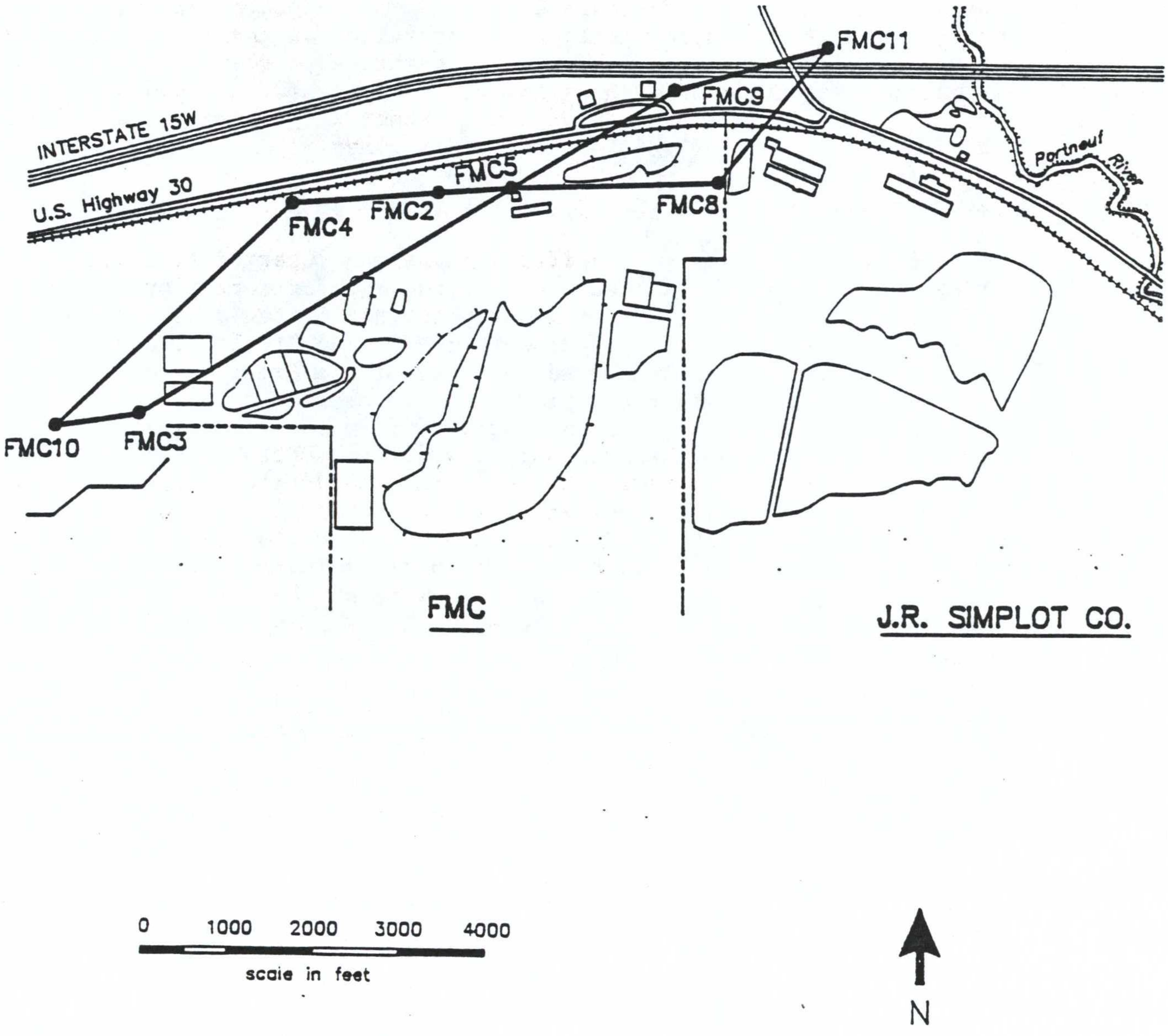
2.3 Ground Water

In general, two main aquifer systems are reported to exist in the Michaud Flats area: an upper, unconfined aquifer formed by the deposits of the Michaud Gravels; and a lower, confined system in the Bighole Basalt, Sunbeam Formation, Pediment Gravel, and Starlight Formation (4, 5) (Table 1). The fine-grained deposits of the American Falls Formation act as a confining layer between these two systems in most parts of the Michaud Flats area (2). Ground water flow in the unconfined aquifer is reportedly to the north-northeast, towards the Portneuf River (5). There are numerous springs located in the floodplain of the river and in low areas south of the American Falls Reservoir (2, 4). These springs may be fed by this upper aquifer. Ground water flow in the confined aquifer is reportedly towards the north to northwest, under natural conditions (5). However, a cone of depression has been reported in the study area due to high rates of pumpage by the industrial facilities (5).

Figures 5 and 6 illustrate a generalized fence diagram constructed by interpretation of the geologic logs from monitoring wells in the study area (6, 7, 8). As shown in Figures 4 and 6, most of the wells in the study area are screened in deposits that have been interpreted as belonging to the Sunbeam Formation, beneath the American Falls unit. A comparison of the potentiometric surface recorded in the monitoring wells in Figure 6 to the lowermost depth of the American Falls deposits indicates that all but one of these wells (FMC #11) are screened in a confined aquifer.

FMC #11 is constructed in deposits above the American Falls Formation, and appears to be under water table conditions. Based on this information, it is apparent that where the American Falls Formation is present beneath the study area, it separates the hydrologic regime into a deeper confined and a shallow unconfined aquifer. This division is probably lost upgradient of the contact between the loess and the older volcanic units, where the American Falls unit is absent. In this area, ground water is likely under unconfined conditions.

The unconfined and confined aquifers are both utilized for drinking, irrigation, and industrial purposes. According to well logs, of the 174 registered wells located within a three-mile radius of the

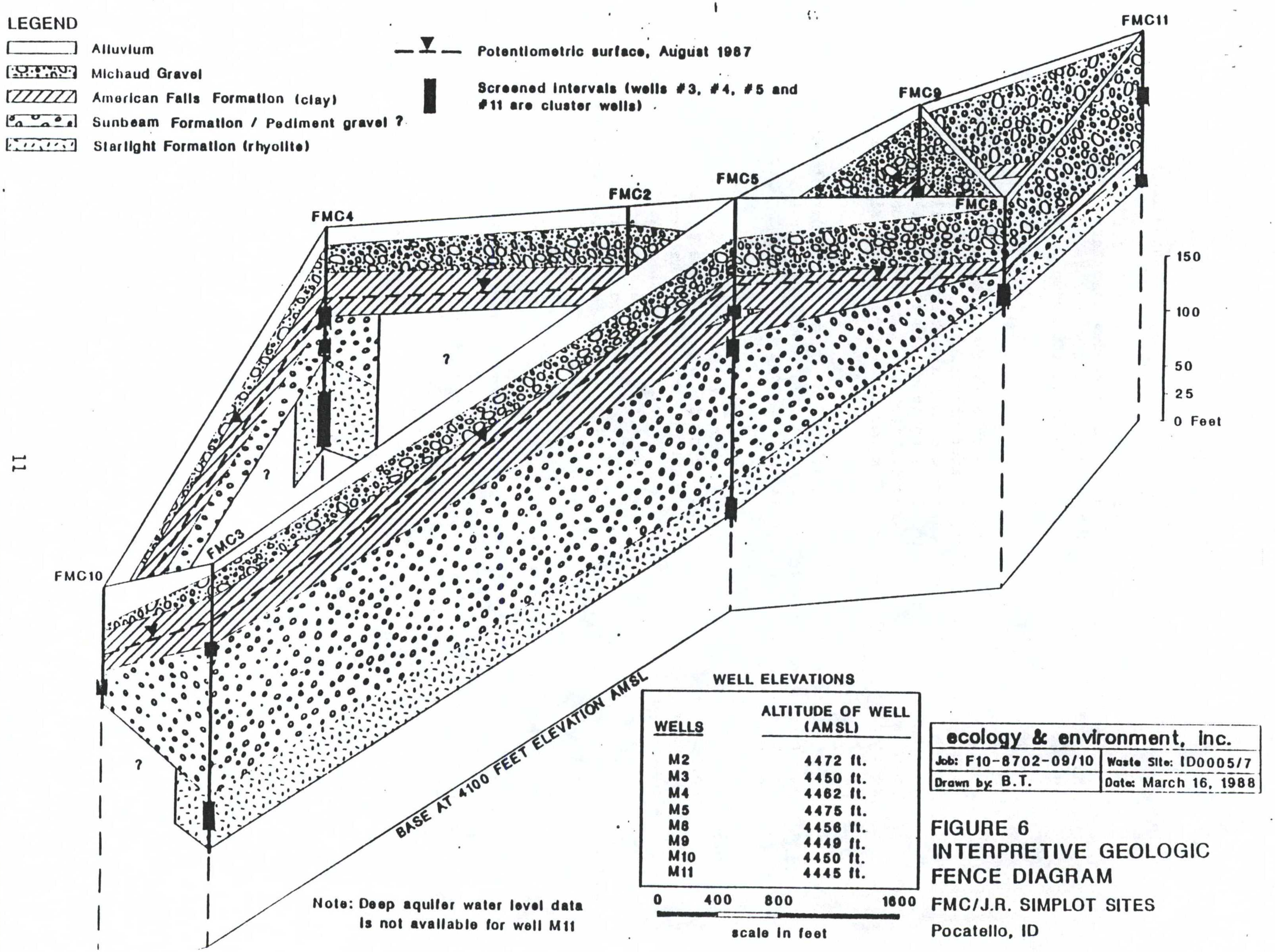


LEGEND

- - - - Property—line
—— Transect line
● Well

ecology & environment, inc.	
Job: F10-8702-10/9	Waste Site: ID0005/7
Drawn by: D. P.	Date: March 17, 1988

FIGURE 5
GEOLOGIC FENCE LINE OF FMC MONITORING WELL LOCATIONS
FMC/J.R. SIMPLOT SITES
Pocatello, ID



WELL ELEVATIONS

WELLS	ALTITUDE OF WELL (AMSL)
M2	4472 ft.
M3	4450 ft.
M4	4462 ft.
M5	4475 ft.
M8	4456 ft.
M9	4449 ft.
M10	4450 ft.
M11	4445 ft.

FIGURE 6
INTERPRETIVE GEOLOGIC FENCE DIAGRAM
FMC/J.R. SIMPLOT SITES
Pocatello, ID

sites, 156 tap the confined aquifer and 18 tap the unconfined aquifer. The City of Pocatello, Idaho (population of 46,340) utilizes several surface water sources and various ground water wells for its drinking water supply. One of these wells is located within three miles of the FMC/Simplot facilities and is screened in the confined aquifer. All water supply lines used by the city are interconnected (2, 6, 9, 10).

2.4 Surface Water

The primary surface water feature in the study area is the Portneuf River. The Portneuf River, located approximately 1,000 feet northeast of the Simplot facility, discharges into the American Falls Reservoir, located approximately 4-1/2 miles north of the two sites. The Portneuf River and American Falls Reservoir are used for irrigation, fishing, and recreation. Approximately 1.75 miles downstream of the sites is a fish hatchery (1, 2).

Approximately 0.5 miles north of the sites is the Batiste Spring. The Batiste Spring provides drinking water to 1,200 to 1,400 Pacific Railroad employees and 30 residences within the Pocatello City Limits (9, 10).

Most of the on-site runoff from the FMC facility is channeled to an unlined lagoon located in the northwest corner of the property. After mixing with boiler blow-down water in the lagoon, the runoff is discharged into the Portneuf River. Most of the on-site runoff from the Simplot facility is collected in the cooling pond and piped to the facilities wastewater treatment plant. There is no discharge to the river since the nutrient rich water is sold to local farmers as irrigation water.

2.5 Climate

The FMC and Simplot Sites are located in a semi-arid climate with average temperatures ranging from 25°F in January to 71°F in July. The average annual precipitation is 10.23 inches, based on American Falls, Idaho records dating from 1951 to 1973 (11). The mean annual evapotranspiration associated with this area is estimated at 37 inches (12). The predominate wind direction is from the southwest (11).

3.0 PROCESS AND WASTE DESCRIPTION

3.1 FMC Corporation

The FMC phosphate processing plant began operation in 1949 and currently produces approximately 250 million pounds of elemental phosphorus per year from two million tons of shale, silica, and coke (13). The elemental phosphorus is temporarily stored at the Idaho plant prior to shipment to FMC processing plants in California, Kansas, New Jersey, West Virginia, and Wyoming. FMC receives its ore from the Gay Mine located 30 miles northeast of Pocatello on the Fort Hall Indian Reservation (2, 13).

13.1.1 Process Description

Elemental phosphorus production at FMC Corporation begins with the unloading of phosphate ore from the rail cars. The ore is crushed, screened, formed into briquettes, and then heated in a traveling grate calciner to remove organic material (13). The calcined phosphate is blended with coke and silica, and fed into electric arc furnaces. Within the furnaces, a chemical reaction produces carbon monoxide and phosphorus gas at 2,500°F to 8,000°F (13). Electrostatic precipitators remove particulate matter from the gas stream before the phosphorous is captured in water spray condensers. Carbon monoxide is routed to the calciners for use as primary fuel. Waste products from the electric arc furnaces include slag (mostly calcium silicate) and ferrophos (13). The ferrophos is crushed, stored, and later sold for its vanadium, iron, and chromium content.

The FMC Corporation provided limited analytical data for the various waste products and feedstocks at the facility, which is presented in the following sections. When possible, this data was supplemented by other sources of data (i.e., U.S.G.S. and Pedco Environmental, Inc. (PEI) reports).

3.1.2 Shale Ore

The shale ore used by FMC is extracted from the Gay Mine and shipped via railroad gondola cars to the plant. According to FMC, the mineralogical composition of the ore is 65% fluorapatite (a phosphate bearing mineral), 19% quartz, 10% illite clays, and 2% to 4% kaolinite (7). Additionally, the shale reportedly contains the following parameters (7):

Parameters	Concentration
Phosphate (P_2O_5)	23.1 - 24.9%
Chromium (Cr_2O_3)	0.14 - 0.17%
Zinc (ZnO)	0.15 - 0.19%
Cadmium (CdO)	0.01%
Lead (PbO)	0.02%
Arsenic	25 ppm

The ore is stored in a large pile east of the processing units (Figure 2). On an annual basis, the ore pile is increased to 1.2 million tons in late summer to enable FMC to operate during the freezing winter months when ore cannot be unloaded (13).

3.1.3 Waste Slag

The waste slag is tapped from the furnaces into a large concrete pit where it is sprayed with water for cooling and fracturing. About 50% of this slag is sold to Bannock Paving for use as highway construction material while the remainder is deposited on a large waste pile in the southern portion of the site (7). Bannock Paving has crushing and storing operations located on the site property west of the plant. The waste slag reportedly contains the following parameters (14):

Parameters	Concentration (mg/kg)
Phosphorus (P_2O_5)	4,920.0
Arsenic	11.4
Barium	530.0
Cadmium	5.4
Chromium	290.0
Lead	29.0
Zinc	110.0

3.1.4 Precipitator Dust/Slurry

The electrostatic precipitator dust is slurried and pumped into a cooling pond ((Pond 8E, Figure 2). The dust is mixed with water to prevent residual phosphorus from oxidizing when exposed to air. On an annual basis, the contents of the cooling pond are pumped into a solar evaporation pond (Pond 9E, Figure 2) for drying. The condensed material is dredged and processed for use as a fertilizer (15). The remaining liquid is decanted and used for process water throughout the plant. The precipitator slurry solids reportedly contain the following parameters (7):

Parameters	Concentration (%)
Phosphorus (P_2O_5)	21.8 - 26.5
Cadmium	0.32 - 0.65
Chromium (Cr_2O_3)	0.03
Lead (PbO)	0.25
Zinc	5.5 - 8.9

Ponds 8E and 9E presently have a double PVC liner with a leachate collection system (15). The cooling pond (8E) was installed in 1984 and the evaporation pond (Pond 9E) in 1986. Three previously used precipitator slurry ponds (1E, 4E, and 9S) were unlined. These ponds were taken out of service by 1982 and the material dried and removed (reportedly except for one pond, 9S, which at the time of the site inspection was being excavated (15)).

3.1.5 Phossy Water/Solids

"Phossy water" is water used to condense the elemental phosphorus. Due to its high phosphorus content, this water is recycled for process use after cooling. The phossy water is pumped to a series of four single lined (PVC) ponds (11S, 12S, 13S, and 14S, Figure 2) for clarification. These four ponds have been in use since 1980 when the previously used, unlined pond (8S, Figure 2) was taken out of service. The unlined pond was being dredged at the time of the site inspection to recover the remaining phosphorus. Water is kept in this pond at all times to prevent the phosphorus from oxidizing.

The settled solids from the four lined ponds are periodically dredged and the material is placed in a double lined waste pond (15S, Figure 2) or processed through a phosphorus recovery process (14). The phossy water and phossy solids reportedly contain the following parameters (14):

PHOSSY SOLIDS

Parameters	Concentration (ppm)	
Phosphorous (total)	80,500	(27%)
Arsenic	2.8	
Barium	90.0	
Cadmium	3,200.0	(0.4%)
Chromium	250.0	
Lead	48.0	
Selenium	13.9	
Zinc	53,000.0	(9.2%)

( ) = FMC supplied data (7).

PHOSSY LIQUIDS (DISSOLVED)

Parameters	Concentration (ppm)
Phosphorous (total)	976 (360 ppm)
Arsenic	0.0024
Barium	0.502
Cadmium	0.14
Chromium	0.26
Lead	0.024
Selenium	ND
Zinc	36.0 (8.0 ppm)

ND = Not detected
( ) = FMC supplied data (7).

3.1.6 Calciner Scrubber Water

The exhaust gas stream from each calciner has a venturi scrubber to control particulate emissions. The scrubber water is sent to an unlined pond for evaporation. This water reportedly contains the following parameters (14):

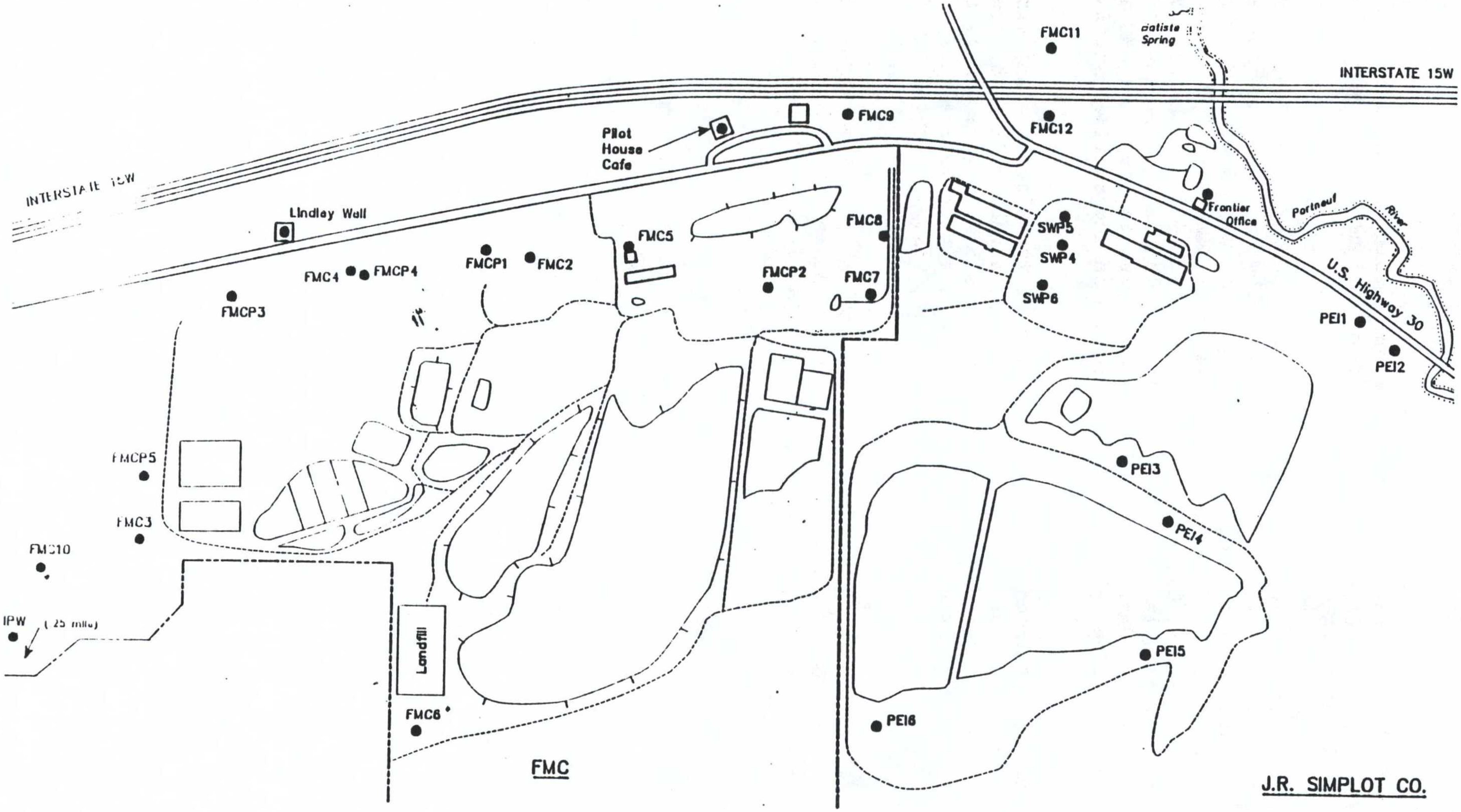
Parameters	Concentration (ppm)
Phosphorous (total)	840.0
Arsenic	0.016
Barium	0.71
Cadmium	3.0
Chromium	1.6
Lead	0.037
Zinc	69.0

FMC anticipates that the scrubber water pond will be taken out of service in 1988 and replaced by two double-lined ponds (1C and 2C, Figure 2) with leachate collection systems (under construction) (15). These ponds will serve as a scrubber water cooling and recycling system. In this system, the water will be mixed with lime before placement in the first pond. Overflow from the first pond will be routed to the second pond for further cooling and clarification before being reused by the scrubbers (2).

3.1.7 Used Oil and Solvents

Due to the high energy usage of the electric arc furnaces, PCB transformers and capacitors have been widely used in the past. Sun Ohio was hired in 1981 to reduce PCBs in all transformer oil to less than 50 ppm. At the time of the site inspection, only one transformer had cooling oil with greater than 500 ppm PCBs and four transformers had cooling oil with PCB content between 50 and 500 ppm (2). All contaminated oil, transformers, and capacitors are sent off site for disposal. A 1979 EPA inspection report states that 50 drums of PCB-contaminated material is landfilled on site. The location of these drums is unknown, but is suspected to be in the slag pile (16). The information gathered on PCB disposal practices at FMC could not be substantiated, but it is unlikely that PCBs would migrate from the site because of PCB's affinity for soil, the slag overburden, and low annual amounts of precipitation.

Used oil and solvents from the FMC laboratory are currently sent off site for recycling or incineration. It is estimated in a 1982 RCRA Generator Inspection Form that small quantities of 1,1,1-trichloroethylene (1,1,1-TCE) (6 to 7 55-gallon drums per year), benzene, and xylene (20 to 30 pounds per month) were used by the FMC Laboratory (16).



LEGEND

Access road

Property line

Production well (P#)

Monitoring well (M#)

Ecology & Environmental, Inc. well (PEI-#)

... completed, only bored and logged

0 750 1500 2250 3000

scale in feet

N

ecology & environment, inc.	
Job: F10-8702-10/9	Waste Site: ID0005/7
Drawn by: D. P.	Date: March 17, 1988

FIGURE 7
GROUND WATER WELL LOCATIONS
FMC/J.R. SIMPLOT SITES
Pocatello, ID

3.1.8 Other Waste Management and Monitoring Practices

In addition to the phossy ponds, precipitator slurry ponds, evaporation ponds, calciner ponds, and slag waste pile mentioned earlier, the FMC facility has a ground water monitoring well network, landfill, and a runoff collection lagoon.

The monitoring well network at FMC consists of 10 monitoring well locations (Figure 7). Five of the ten are clusters of two or three wells consisting of a shallow well (58-110 feet deep) combined with an intermediate well (106-225 feet deep) and/or a deep well (157-309 feet deep). These wells, installed between 1978 and 1980, are sampled by FMC twice a year; once in the Spring and once in the fall. The analytical results from past sampling events are summarized in Table 2. FMC also has five production wells which are screened in the confined aquifer (Figure 7).

The current landfill is located south of the slag pile and was constructed in 1980 (2). It contains fiberglass scrubber filters, crushed drums and office trash. Each type of waste is placed in separate cells and covered with native soil. Prior to 1980, wastes were landfilled in areas beneath the present slag pile (2). The wastes in these landfills are unknown.

Most of the on-site runoff is channeled to an unlined lagoon located in the northeast corner of the property. After mixing with boiler blow-down water in this lagoon, the runoff is discharged into the Portneuf River (2).

3.2 J.R. Simplot Company

The Simplot company began operation in 1944, producing concentrated phosphoric acid, triple super phosphate, ammonium phosphate, and diammonium phosphate from phosphate containing ore. The ore is shipped from the Conda Mine year around and from the Gay Mine from May through October. The Gay Mine ore is blended with the Conda Mine ore and used throughout the year.

3.2.1 Process Description

The Simplot plant utilizes a wet process to produce phosphoric acid. Ground phosphate rock is digested with sulfuric acid to produce phosphoric acid and calcium sulfate (gypsum). Slurry from the digester, which consists of gypsum and phosphoric acid, is pumped to a vacuum filter for separation of gypsum solids from the liquid (32% P_2O_5) phosphoric acid (14). The filtercake is dried by suction, the filter pan is inverted, and the cake is then washed from the filter with recycled gypsum pond water. The gypsum slurry consists of approximately 40% solids prior to pumping the slurry to the gypsum stack. The phosphoric acid from the filtration stage is concentrated to 54% P_2O_5 by vacuum evaporation of the water (14). The concentrated phosphoric acid may be blended with the lower concentration acid for use in a variety of products (14).

TABLE 2

FMC MONITORING WELL DATA
1984 – 1986
Concentration (mg/l)

	2S	2I	2D	3S	3D	4S	4I	4D	5S	5I	5D	7S	8S	9S	10S	11S	11I	12S
Arsenic	.055-.08	.003-.007	.001-.002	.008-.023	.003-.01	.004-.014	.005-.011	.005-.013	.018-.015	.022-.037	.004-.013	*-.185	.001-.176	.011-.022	.002-.006	.002-.003	.001-.003	.017-.019
Avg.	.065	.004	.002	.014	.005	.007	.007	.009	.036	.030	.007	.040	.080	.017	.004	.002	.009	.035
# Samples	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Cadmium	*-.011	*-.007	*-.005	*-.006	*-.006	*-.008	*-.008	*-.008	*-.006	*-.005	*-.004	.002-.033	.003-.035	*-.006	*-.011	*-.006	*-.012	*-.007
Avg.	.004	.002	.002	.003	.003	.004	.004	.003	.003	.002	.002	.012	.0012	.002	.004	.002	.003	.003
# Samples	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Tot. PO_4	72-1510	*-9.8	*-.2	10-38	*-.6	*-.3	.1-.7	.6-1.0	10-30	18-62	*-.2	*-17	1.4-15	4.4-8.2	*-.2	*-.7	*-.1	5-72
Avg.	282.6	.001	.06	18.1	.30	.14	.51	.83	16.7	36.1	.11	3.6	5.7	5.7	.09	.11	.04	33.5
# Samples	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	8
Chloride	153-400	22-99	24-105	131-329	27-117	158-310	165-300	156-305	174-400	44-195	35-156	69-353	90-353	199-360	57-275	66-204	15-90	42-195
Avg.	273.1	49.8	54.6	222.1	64.9	240.4	227.4	234.0	266.1	101.1	82.4	216	269	271.2	120.5	148.9	43.2	136.1
# Samples	8	6	7	8	7	8	8	8	8	7	7	8	8	8	7	8	8	8
Screened Interval Below Land Surface (feet)	97-110	185-225	292-309	74-91	220-247	74-84	106-118	157-200	98-100	140	272-283	75-105	80-95	76-80	87-98	46-58	126-135	52-62

S = Shallow Well
I = Intermediate Well
D = Deep Well
* = Not detected

3.2.2 Gypsum Solids and Liquids

Gypsum is produced at a rate of approximately 1.34 million tons per year from the phosphoric acid manufacturing process. It is pumped as a thick slurry to a stack, where the liquid fraction is decanted and recirculated through the system. There are approximately 28 million cubic yards of gypsum in the present stack. A former gypsum stack was abandoned in 1966 (Figure 2). The gypsum liquids and solids reportedly contain the following metals (8, 14, 17):

GYPSUM SOLID

Metal	Concentration (mg/kg)	# Samples
Arsenic	1.5 - 3.5 (2.35)	6
Barium	38.5 - 240 (94.58)	6
Cadmium	3.1 - 43.9 (13.33)	6
Chromium	8.8 - 68.4 (45.70)	6
Lead	8.0 - 56.0 (28.33)	6
Vanadium	8.8 - 140.0 (47.20)	4
Zinc	0.59 - 295.0 (102.20)	6

( ) = Average value

GYPSUM LIQUIDS (POND)

Metal	Concentration (mg/l)	# Samples
Arsenic	0.003 - 0.10 (0.26)	5
Barium	0.10 - 2.8 (0.89)	5
Cadmium	0.25 - 8.25 (5.04)	5
Chromium	0.93 - 8.9 (6.17)	5
Lead	0.01 - 0.53 (0.21)	5
Vanadium	1.5 - 31.0 (15.9)	4
Zinc	1.6 - 56.0 (30.15)	4

( ) = Average value

DECANT GYPSUM LIQUID (UNFILTERED)

Metal	Concentration (mg/l)	# Samples
Arsenic	0.009 - 0.33 (0.13)	3
Barium	0.08 - 2.2 (0.81)	3
Cadmium	0.26 - 8.35 (4.90)	3
Chromium	0.8 - 10.0 (5.4)	2
Lead	0.041	1
Vanadium	1.3 - 20.7 (13.3)	3
Zinc	1.6 - 47.6 (27.73)	3

( ) = Average value

3.2.3 Other Waste Management and Monitoring Practices

The Simplot facility currently utilizes a wastewater treatment system (three ponds), and two on-site ponds to collect and treat all wastewater not recycled. A ground water monitoring network (Figure 7) and three production wells are utilized on site. The wastewater from the facility flows through a diversion gate controlled by a pH meter. Any wastewater outside the pH control limits (4.6 - 8.6) is automatically diverted to a holding pond where it is mixed with boiler blow-down pond water and the pH is adjusted (8). High pH water is treated by mixing with low pH water and low pH water is treated with soda ash. The treated water flows to a settling pond, and finally to an equalization pond where treated water is combined with other effluent from the plant which did not require treatment (8). The water is then pumped through a final pH meter (which shuts off the pump if the pH is too low or high) to a large surge pond where it is be used for irrigation. The three wastewater treatment ponds are lined to prevent discharge of the Simplot effluent to the Portneuf River (8).

Two additional ponds exist on the Simplot property; one east of the plant and one north of the gypsum stack. The pond east of the plant receives boiler blow-down cooling water and some surface runoff, which is then piped to the wastewater treatment plant. The second pond receives gypsum liquid which is collected from under the stacks by perforated PVC pipes (8).

In 1984, PedCo Environmental, Inc. (PEI) installed six monitoring wells at the Simplot facility as part of an EPA study on the phosphorus processing industry (Figure 7). These wells ranged in depth from 48 feet to 245 bgs. Three production wells are also present on the Simplot property. Table 3 summarizes the ground water sample data from these six monitoring wells (14, 17).

3.3 Past Investigations

- Between 1972 to 1973, the Idaho Department of Health and Welfare conducted a ground water monitoring study downgradient of the

TABLE 3
SIMPLOT MONITORING WELL DATA
Concentration (mg/l)

Metals	Background Wells					
	PEI 6	PEI 5	PEI 3*	PEI 4	PEI 1	PEI 2
ARSENIC	<.001-.006	<.001-.003	<.001-.024	<.001-.7	<.001-.004	<.001-.006
Avg.	.0025	.0006	.011	.24	.0008	.0013
# Samples	8	8	4	9	9	9
BARIUM	.05-.35	.04-.40	.06-.24	.03-.25	.04-.22	.12-.35
Avg.	.10	.098	.11	.072	.14	.17
# Samples	8	8	4	9	9	9
CADMIUM	<.001-.013	<.001-.004	<.001-.021	<.001-.028	<.001-.011	<.001-.007
Avg.	.0004	.0011	.006	.005	.001	.002
# Samples	8	8	4	9	9	9
CHROMIUM	<.001-.003	<.001-.009	<.001-.01	<.001-.02	<.001-.01	<.001-.01
Avg.	.0004	.0011	.006	.005	.001	.002
# Samples	8	8	4	9	9	9
LEAD	<.001-.04	<.001-.04	.004-.11	<.001-.16	<.001-.04	<.001-.05
Avg.	.012	.006	.04	.024	.007	.013
# Samples	8	8	4	9	9	9
VANADIUM	<.001-.006	<.001-.006	<.003-.02	<.001-.11	<.001-.013	<.001-.05
Avg.	.0007	.0007	.005	.02	.013	.005
# Samples	8	8	4	9	9	9
ZINC	<.001-.064	<.003-.672	.024-.102	.152-1.28	<.001-.044	<.001-.108
Avg.	.036	.14	.058	.34	.018	.04
# Samples	8	8	4	9	9	9
SCREENED INTERVAL BELOW LAND SURFACE (feet)	200-220	225-245	143-163	185-265	28-48	25-45

* - Monitoring Well 3 is currently damaged and not in use.

Source: Ref. 14, 17.

phosphate processing facilities. Ground water samples analyzed by the State of Idaho indicated levels of arsenic, lead, and cadmium above the Primary Federal Drinking Water Standards; and fluoride and manganese above the Secondary Drinking Water Standards in four downgradient wells. The Pilot House Cafe well is 113 feet bgs and was condemned in 1976 due to high arsenic levels (maximum arsenic concentration was 7.48 mg/l). Later that year, FMC redrilled a well to a depth of 200 feet bgs. Water samples of the new well in November 1977 indicated no contamination (18).

- In 1977, the United States Geologic Survey (USGS) prepared an Environmental Impact Statement (EIS) which attributed relatively high phosphate levels (0.35 to 7.5 ppm as PO_4) in the Batiste Spring to the nearby phosphorus industries (18). The EIS also presented data from water samples collected from FMC Corporation waste ponds. The data indicated arsenic levels ranging from 4.4 to 22 mg/l, cadmium from 0.56 to 3.4 mg/l, and zinc from 0.25 to 92 mg/l (18).

- In 1980, the USGS conducted the first of two ground water monitoring studies to determine water quality in the vicinity of FMC and Simplot. The 1980 report concluded that there is some degree of contamination in several wells drawing water from the water table system, and that the deeper confined aquifer seems contaminant-free (5). Table 4 summarizes those parameters measured in two downgradient wells and two waste ponds during the USGS study (5).

TABLE 4

1980 U.S.G.S. WELL AND POND DATA
(ug/l)

Parameter	Pilot House Well	Lindley Well	Simplot Decant Pond	FMC Slurry Pond
Arsenic	40.0	7.0	160	120
Cadmium	1.0	1.0	14,000	200
Chromium	1.0	1.0	9,100	250
Lead	10.0	10.0	300	200
Zinc	3.0	310.0	26,000	47,000
Boron	960.0	160.0	1,300	3,400
Specific Conductivity	1,630 umhos	1,760 umhos	15,696 umhos	5,235 umhos

TABLE 5

1984 GROUND WATER AND SPRING DATA
Concentration (ug/l)

Parameter	Background Well (Idaho Power)	Pilot House Well	Lindley Well	Batiste Spring	EPA Drinking Water Standards
ARSENIC	<0.001 - 21.0	4.0 - 64.0	<0.001 - 16.0	16.0 - 53.0	
Avg.	14.7	43.8	6.6	26.3	50.0*
# Samples	20	20	20	20	
BORON	<0.001 - 170.0	10.0 - 928.0	88.0 - 473.0	165.0 - 642.0	NSE
Avg.	75.05	748.8	257.0	288.8	
# Samples	20	18	18	18	
ZINC	35.0 - 600.0	<0.001 - 48.0	65.0 - 600.0	3.0 - 30.0	5000.0**
Avg.	491.0	18.8	241.7	17.4	
# Samples	9	9	9	9	
Specific Conductance (umhos)	370 - 600	1,550 - 1,930	941 - 2,598	965 - 1,900	NSE
Avg. (umhos)	475.7	1,734.7	1,764.4	1,264.5	
# Samples	20	19	20	20	

NSE - No Standard exists.
* - National Primary Drinking Water Regulations, Maximum Contaminant Level (40 CFR, Part 141).
** - National Secondary Drinking Water Regulations (40 CFR, Part 143). These regulations are set for taste, color, odor, and other aesthetic considerations which are not health related.

- In 1983, the U.S. EPA contracted PEI to evaluate the waste management practices of phosphate processing plants across the nation (17). PEI installed monitoring wells at the Simplot facility and collected various ground water and waste samples from both FMC and Simplot. These data have been incorporated in earlier sections of this report.

- The U.S.G.S. continued its ground water monitoring program into 1984 and produced a report on the hydrology of the Michaud Flats (4). Table 5 summarizes the ground water and spring sample analyses by the U.S.G.S. and a J.R. Simplot contract laboratory (4, 18). The U.S.G.S. is presently conducting a long term ground water study in the Michaud Flats.

4.0 FIELD ACTIVITIES

4.1 Objectives and Scope

The objectives of the FMC/Simplot site inspections were to:

- identify potential sources at both facilities which may be contaminating the unconfined aquifer;

- preliminarily determine the magnitude of the ground water contamination in the area; and

- analyze the results of the site investigation and determine whether further study is warranted.

To accomplish these objectives, the following general field activities were conducted:

- performed an electromagnetic (EM) conductivity survey of the site and downgradient of the site using the EM34-3;

- performed a background EM survey to establish a range of natural conductivity values;

- collected ground water samples from three on-site Simplot monitoring wells and 10 FMC monitoring wells;

- collected ground water samples from the three on-site Simplot production wells and three FMC production wells;

- collected ground water samples from four downgradient domestic wells and one (upgradient) background domestic well;

- collected a water sample from the Batiste Spring located north of Simplot;

- collected six surface water and five sediment samples from Simplot's various waste ponds, and one water and one sediment sample from the surface runoff into the wastewater treatment system;

- collected seven surface water and seven sediment samples from FMC's various waste ponds;

- collected one waste slag sample from Bannock Paving Company's crushed slag pile and one waste ferrophos sample from FMC's ferrophos pile;

- collected a soil sample from underneath the ferrophos pile and a background soil sample from south of the FMC facility;

- analyzed domestic well, production well and Batiste Spring samples for EPA Target Compound List (TCL) metals, TCL base/neutral/acid fraction, TCL pesticides, and volatile organic fraction, fluorides, chlorides, total phosphorus, and silica;

- analyzed monitoring well and surface water samples for TCL metals, fluoride, chloride, total phosphorous, and silica; and

- analyzed all other samples for TCL metals, fluoride, chloride, and silica.

4.2 Geophysical Survey

The objective of the geophysical survey was to identify anomalous areas potentially indicative of ground water contaminant plumes emanating from waste ponds at the FMC and Simplot facilities. The primary geophysical instrument used in the survey was the Geonics Ltd. EM34-3 electromagnetic conductivity meter. Additionally, the Geonics Ltd. EM31 was used to estimate influences from cultural features on the EM34-3 data.

4.2.1 Theory and Description of Geophysical Techniques

The Geonics Ltd. models EM31 and EM34-3 are equipped with transmitting and receiving coils connected to meters that measure units of conductivity in millimhos per meter. The transmitter coil induces circular eddy current loops in the subsurface. The amplitude of any one of these current loops is directly proportional to the terrain conductivity in the vicinity of that loop. The current loops generate a secondary magnetic field, part of which is intercepted by the receiver coil and read on the meter (19, 20).

Terrain conductivity is a variable of several factors, but is largely keyed to the concentration and abundance of electrolytic solutions and to the presence of metallic items in the subsurface. Potential metals contamination from the waste ponds would contribute large amounts of electrolytes to the unsaturated and saturated zones resulting in an increase in the terrain conductivity. The EM instruments were used in an attempt to detect this increase in conductivity above natural background values.

The conductivity value resulting from an EM instrument is a composite, and represents the combined effects of the thickness of soil or rock layers, their depths, and the specific conductivities of the materials (19). The instrument reading represents the combination of these effects, extending from the surface to the exploration depth(s) of the instrument (19). The exploration depth of the instrument is defined as the depth above which 75% of the measured signal is derived assuming uniform conductivity with depth (19).

The exploration depths selected for the EM34-3 survey of the FMC and Simplot facilities were 7.5, 15, and 30 meters. Two separate intervals between the transmitter and receiver coils of 10 and 20 meters were used to achieve the desired exploration depths. Two readings were obtained for each coil interval, one while the receiver and transmitter rings were positioned perpendicular to the ground surface (or horizontal dipole) and one reading after the rings were laid on the ground parallel to the surface (or vertical dipole). The horizontal dipole is sensitive to variations in near surface materials, and the vertical dipole configuration is sensitive to vertical features in the subsurface (i.e. joints, faults and vertical dike-like features) (20, 21). Transmitter/receiver coil spacing intervals, orientation, and corresponding survey depths are summarized in Table 6.

TABLE 6

EM34-3
SPACING INTERVALS, ORIENTATION AND SURVEY DEPTHS

Spatial Separation of Transmitter/Receiver Coils (meters)	Coil Orientation	Effective Survey Depth (meters)
10	Vertical	7.5
10	Horizontal	15
20	Vertical	15
20	Horizontal	30

4.2.2 Geophysics Survey Method

Fourteen areas were surveyed using the EM34-3 (A through L, FMC and Bkg Grids) (See Figure 8). The survey lines were set up on 50-foot intervals (except Grid B, which had two lines 100 feet apart). Available information indicates ground water flow movement in the area is to the north-northeast in the unconfined aquifer. Survey areas were therefore chosen along the northwest, north and northeast sides of the FMC and

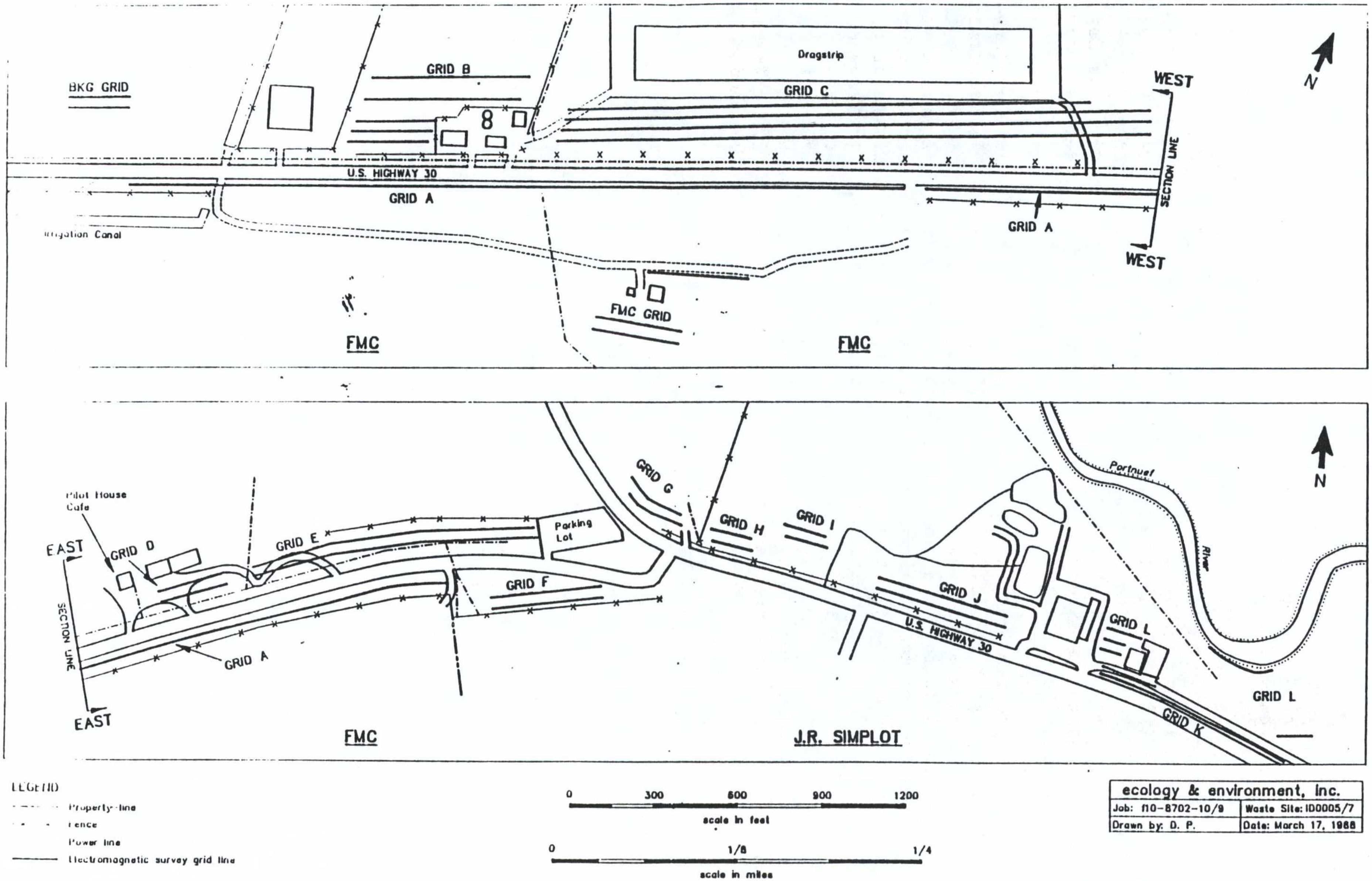


FIGURE 8
EM GRID LOCATIONS
FMC/J.R. SIMPLOT SITES
Pocatello, ID

TABLE 7

EM 34-3 GRID LINE SUMMARY

Line #	Length (m)	Direction	Location
Background Lines (Bkg Grid):			
1 Bkg	100	E. to W.	475' west of irrigation canal and 250' north of Highway 30.
2 Bkg	100	W. to E.	50' north of line #1 Bkg.
Lines West of Lindley Residence (Grid B):			
1B	120	W. to E.	40' east of commercial property N-S fence and 50' north of E-W fence parallel to highway.
2B	120	E. to W.	50' north of line #1B.
3B	120	W. to E.	50' north of line #2B.
4B	240	W. to E.	100' north of line #3B.
5B	240	E. to W.	100' north of line #4B.
Lines South of Drag Strip (Grid C):			
1C	920	W. to E.	150' east of Lindley's N-S property fence and started 50' north of E-W fence parallel to highway.
2C	920	E. to W.	50' north of line #1C.
3C	920	W. to E.	50' north of line #2C.
4C	800	E. to W.	50' north of line #3C.
Lines Southeast of Pilot House Cafe (Grid D):			
1D	100	W. to E.	100' south of grain testing building and 50' north of E-W power lines.
2D	100	E. to W.	50' north of line #1D.

TABLE 7 (Cont.)

Line #	Length (m)	Direction	Location
Lines West of Dirt Parking Lot (Grid E):			
1E	440	W. to E.	45′ east of N-S power line and 50′ north of E-W power lines.
2E	440	E. to W.	50′ north of line #1E.
Lines South of Highway and North of R. R. Tracks (Grid F):			
1F	150	W. to E.	35′ north of E-W Simplot property fence and 200′ east of N-S section of FMC/Simplot property line fence.
2F	150	E. to W.	50′ north of line #1F.
Lines Southeast of Interstate 15 on Ramp (Grid G):			
1G	100	E. to W.	50′ north of fence and follows curvature of fence.
2G	100	W. to E.	50′ north of line #1G.
Lines East of Short Power Line (Grid H):			
1H	60	W. to E.	55′ east of N-S fence and 50′ north of E-W fence.
2H	60	E. to W.	37′ east of N-S fence and 50′ north of line #1H.
Lines West of Runoff Route to Treatment Ponds (Grid I):			
1I	60	E. to W.	165′ north of E-W fence and 25′ east of steep embankment.
2I	60	W. to E.	50′ north of line #1I.

TABLE 7 (Cont.)

Line #	Length (m)	Direction	Location
Lines South of Treatment Ponds (Grid J):			
1J	190	E. to W.	135′ west of N-S dirt road and 50′ north of E-W fence.
2J	190	W. to E.	50′ north of line #1J.
Lines to Simplot Employee Park (Grid L):			
1L	60	SW. to NE.	75′ north of E-W road and 30′ east of power lines.
2L	100	W. to E.	40′ north of NW-SE power lines and follows bend in Portneuf River.
3L	20	W. to E.	Frontier Park Parking lot, 40′ north of E-W road.
4L	20	E. to W.	40′ north of E-W road and west of tennis courts.
5L	20	W. to E.	50′ north of line #4L.
6L	40	E. to W.	60′ north of line #5L.
Lines South of Bannock Paving Company (FMC Grid):			
1 FMC	120	W. to E.	140′ north of E-W fence and south of Bannock Paving Operation.
2 FMC	120	E. to W.	50′ north of line #1 FMC.
3 FMC	140	W. to E.	North of Paving Operation along south side of road and ends 30′ west of gate.

Note: Grids A and K were not included since they were not used in con tour maps.

Total # of Lines = 34 Total Meters = 7,440 meters (22,692 feet)

See Figure 8 for Grid Locations.

Simplot facilities. The grid lines were arranged to minimize interferences from cultural features such as metal fences and power lines. In cases where cultural interferences clearly affected the EM readings, the values were not used in the conductivity contour maps. Grid A values, located north of the railroad tracks and south of Highway 30, were not plotted on the contour maps due to interference with an underground metal sprinkler system. Grid L values, located just north of Highway 30 and south of the Simplot employees park, were also eliminated because of interference with an abandoned sewer line. In addition to these two grids, individual values in Grids C, D, E, and the FMC grid were eliminated due to interference with underground pipes (see Figure 8).

The EM34-3 conductivity meter was utilized from August 24 to August 29, 1987, to survey 34 lines for a total of 7,440 meters. The length and general description of the location of each grid line is summarized in Table 7. As previously mentioned, the EM34-3 survey used two different intervals between the transmitter and receiver coils (10 and 20 meters) to measure the various depths of 7.5, 15, and 30 meters. The EM34-3 was calibrated each morning prior to use, each afternoon after lunch, and each time a new coil spacing was utilized on the instrument.

4.3 Sample Number, Types, and Analysis

A total of 67 samples, including 24 ground water, one spring, 14 surface water, 13 sediment, two soil, two solid waste, and 11 quality assurance/quality control samples were collected at the FMC/Simplot Sites. Table 8 summarizes sample types, numbers, and analytical requirements.

Of the 24 ground water samples, 13 were collected at the FMC facility, six from the Simplot facility, and five from off-site domestic wells. Ground water sample locations are illustrated in Figure 7. Each ground water sample was analyzed for total Target Compound List (TCL) metals, total phosphorous, fluoride, chloride, and silica. The Batiste Spring, and the production and domestic well samples were analyzed for TCL volatile organic base/neutral/acid extractables and pesticide fractions, as well as TCL metals, total phosphorous, fluoride, chloride, and silica.

Seven of the 14 surface water samples were collected from FMC waste ponds at locations indicated in Figure 9. The remaining seven were collected from Simplot waste ponds at locations indicated in Figure 10. Each surface water sample was analyzed for total TCL metals, total phosphorous, fluoride, chloride, and silica (Table 8).

Thirteen sediment, two soil, and two solid waste samples were collected from the FMC and Simplot facilities. Seven of the 13 sediment samples, as well as both soil and solid waste samples were collected from FMC's waste ponds, ferrophos pile, and slag pile at locations indicated in Figure 9. The remaining six sediment samples were collected from Simplot waste ponds at locations indicated in Figure 10. Each sediment, soil, and solid waste sample was analyzed for total TCL metals, fluoride, chloride, and silica (Table 8).

TABLE 8

SAMPLE SUMMARY

Facility	Sample Matrix	Sample Number	QA/QC Samples: Blanks	QA/QC Samples: Duplicates	QA/QC Samples: Rinsate	Sample Type	Analytes	Locations
FMC[1]	Ground water	3	1			Unfiltered Grab	3,4,5,6	3-Production Wells (FMP 1,3, and 4)
	Ground water	10		1	1	Unfiltered Grab	3,5,6	10-Monitoring Wells (FMC 2,3,4,5,7, 8,9,10,11, and 12)
	Surface water	7		1		Unfiltered Grab	3,5,6	Ponds: 8S, 13S, 8E, rainwater lagoon, slag pond, cooling pond, and calciner pond.
	Sediment	7		1		Grab	3,5	Ponds: 1E, 4E, 9S, calciner pond, cooling pond, slag pond, and rainwater lagoon.
	Soil/Waste	4				Grab	3,5	2-Soil (ferrophos and background soil) 2-Waste (slag and ferrophos pile)
Simplot[2]	Ground water	3				Unfiltered Grab	3,4,5,6	3-Production Wells (SWP 4,5, and 6)
	Ground water	3		1		Unfiltered Grab	3,5,6	3-Monitoring Wells (PEI 1,2, and 6)
	Surface water	7	1	1		Unfiltered Grab	3,5,6	Ponds: Gypsum slurry, gypsum liquid pond, East overflow pond, and three treatment ponds. 1-Run-off Route
	Sediment	6		1		3-Grab 3-Composite	3,5	Ponds: Gypsum slurry, gypsum stack (0-6"), gypsum stack (2'), gypsum liquid pond, and East overflow pond. 1-Run-off Route
Off Site	Ground water	5	1			Unfiltered	3,4,5,6	5-Domestic Wells
	Surface Water	1		1		Grab	3,4,5,6	1-Batistic Spring

1 - FMC sample locations are illustrated in Figures 7 and 9.
2 - Simplot sample locations are illustrated in Figures 7 and 10.
3 - Denotes total metals.
4 - Denotes BNAs and volatiles.
5 - Denotes fluoride, chloride, and silica.
6 - Denotes total phosphorous.

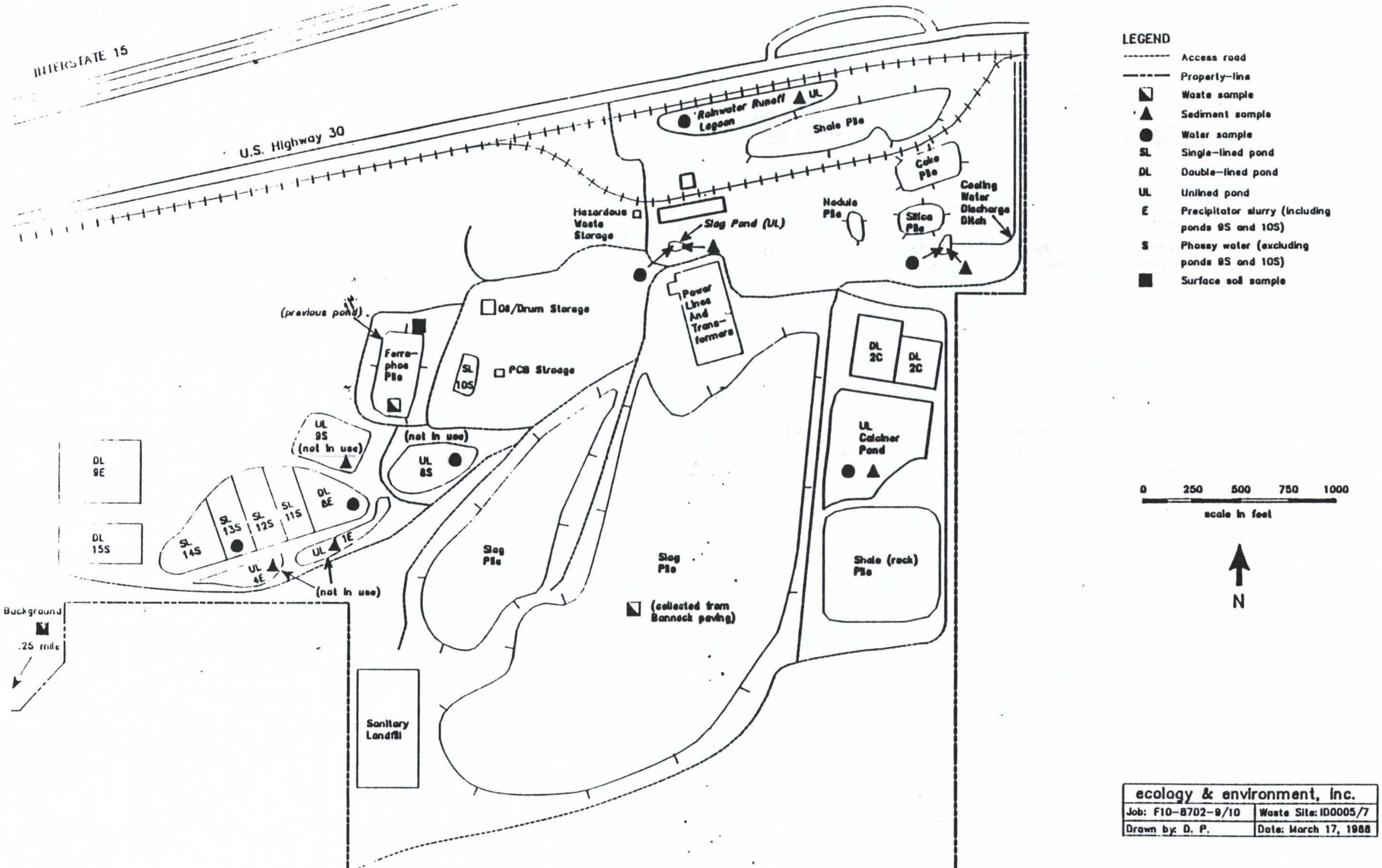
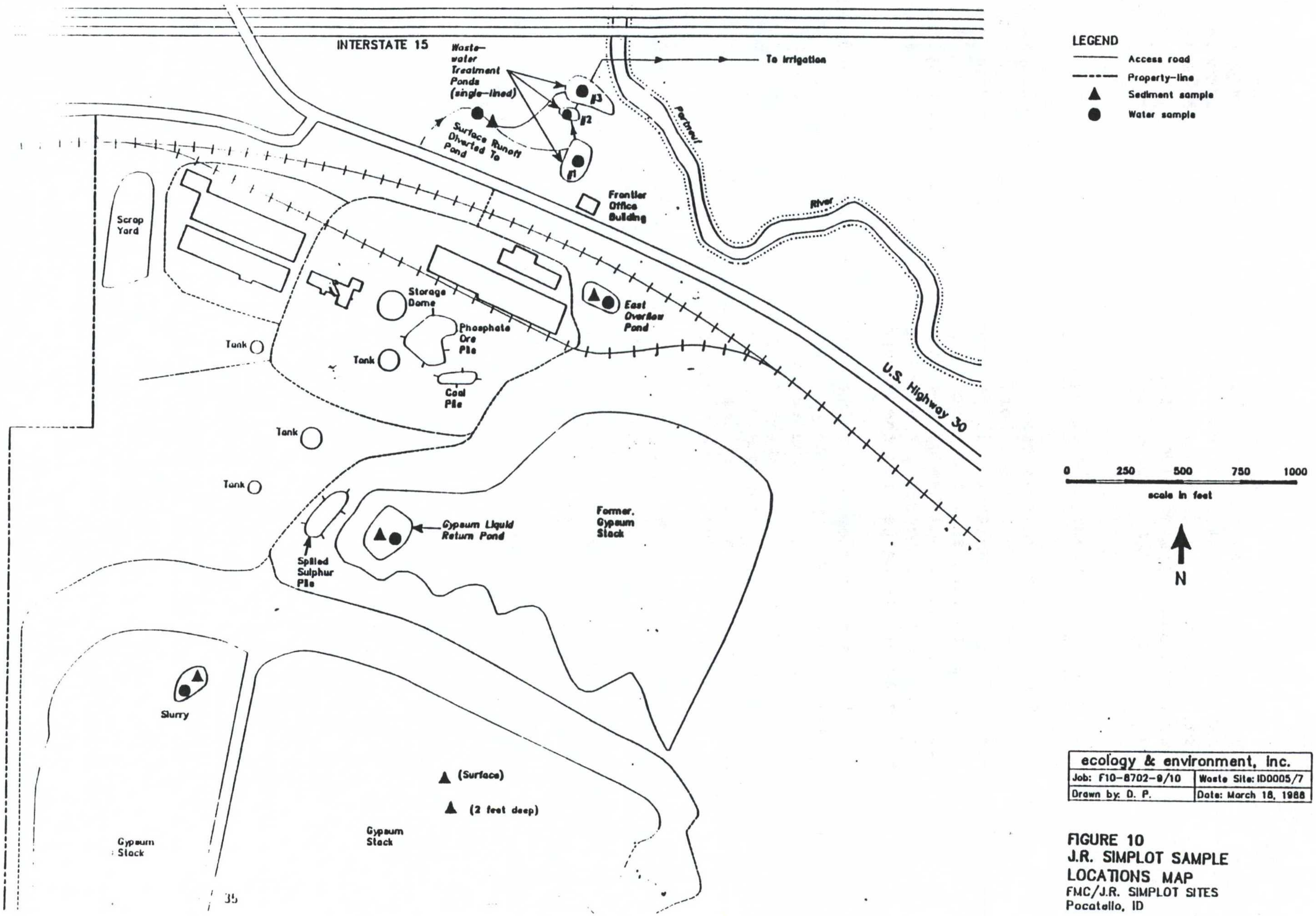


FIGURE 9
FMC SAMPLE LOCATIONS MAP
FMC/J.R. SIMPLOT SITES
Pocatello, ID



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Drawn by: D. P.	Date: March 18, 1988

FIGURE 10
J.R. SIMPLOT SAMPLE LOCATIONS MAP
FMC/J.R. SIMPLOT SITES
Pocatello, ID

Quality assurance samples included duplicates, a rinsate sample, and transport blanks. At least 10% of the samples were flagged for duplicate analysis to evaluate consistency of the sampling technique and assess laboratory performance. The rinsate sample was collected from one of the E&E supplied, dedicated bailers prior to use for sampling. Four transport blanks were prepared (one for each different sample bottle lot used) in the field.

4.4 Sampling Methodologies and Decontamination

Samples from the five domestic and six production wells were collected directly into samples bottles from the faucet after purging the lines of standing water for 15 to 45 minutes. The production wells were not purged as long as the domestic well samples since the production wells are in continual use by the facilities. The Batiste Spring sample was collected by submerging the sample containers below the water near the point of discharge from the ground.

The water samples were monitored for pH, temperature, and conductivity immediately after collection. Each domestic and production well sample, as well as the spring sample, was collected in two 40-ml vials (volatile organics), four one-liter polyethylene bottles (one for total metals, one for total phosphate and total phosphorous, one for fluoride and chloride, and one for silica), and four 1-liter amber jugs (two for pesticides and two for base/neutral/acids).

The monitoring well samples were collected using the following process:

- o the static water level measurement was obtained using a clean electric sounder and the static volume calculated;
- o three static volumes of water were purged using a submersible pump (and decontaminating the pump between wells);
- o purge water was monitored for pH, temperature, and conductivity; and
- o samples were obtained using dedicated PVC bailers.

Table 9 summarizes the static volume, purged volume, and type of pump used for each monitoring well. The PVC bailers were decontaminated in E&E's base support laboratory prior to the sampling visit. The monitoring well samples were collected in four one-liter polyethylene bottles; one for total metals, one for total phosphorous and total phosphate, one for fluoride and chloride, and one for silica. All well sampling data were recorded on E&E Well Sampling Data Sheets (see Appendix F).

TABLE 9

MONITORING WELL STATIC AND PURGE VOLUMES

Well #	Static Volume (gallon)	Purge Volume (gallon)	Pump
FWM #2	51	160	3-1/2" Submersible
FWM #3	69	300	3-1/2" Submersible
FWM #4	29	120	3-1/2" Submersible
FWM #5	17	63	3-1/2" Submersible
FWM #7	60	100 (dry)	2" Submersible
FWM #8	16.5	75	2" Submersible
FWM #9	23	150	3.5" Submersible
FWM #10	56	270	3.5" Submersible
FWM #11	24	75	2" Submersible
FWM #12	15	60	2" Submersible
PEI #1	74	250	3HP Franklin
PEI #4	15.5	60	2" Submersible
PEI #6	13	60	2" Submersible

The various pond water samples (except for the gypsum slurry sample) were collected using a pond sampler with a dedicated glass beaker for each sample. The pond sampler consists of a 10-foot long pole which a glass beaker can be fastened to one end using a large round clamp. Each sample was placed in four one-liter polyethylene bottles. The Simplot gypsum slurry sample was collected in a clean, stainless steel bucket. After allowing the sediment to settle, the liquid was decanted into four one-liter polyethylene bottles and the sediment was placed in two eight-ounce jars as a separate sample; one jar for TCL metals and one jar for fluoride, chloride, and silica. Field measurements of pH, temperature, and conductivity were recorded for all surface water samples.

Grab pond sediment samples were collected using the pond sampler by pulling the glass beaker across the bottom of the pond. Composite samples from the Simplot gypsum stack (0 to 6 inches), the gypsum liquid pond sediment, and the runoff route sediment consisted of three aliquots each. A stainless steel spoon was used to collect the aliquots from the gypsum stack and runoff route. The material was placed in ziplock plastic bags and homogenized before filling two eight-ounce jars. The subsurface gypsum sample from Simplot was collected at a depth of two feet using a soil hand auger.

Soil was collected from beneath the FMC ferrophos pile with a stainless steel spoon to a depth of six inches and placed in two eight-ounce jars. A background soil sample was collected north of the Idaho Power station to a depth of six inches using a stainless steel spoon.

Crushed waste slag, collected from the Bannock Paving Company, and ferrophos samples were placed directly in two eight-ounce jars. The ferrophos chunks were crushed in FMC's laboratory.

All sampling equipment (bailers, stainless steel spoons, ziplock bags, etc.) with the exception of pumps and and the pond sampler pole, was dedicated to minimize cross-contamination between sample locations. The dedicated equipment was either rinsed, double-bagged and returned to E&E's base support facility for full decontamination, or double-bagged and disposed as expendable equipment in the local landfill. Miscellaneous refuse generated during the investigation was double bagged and disposed of in the local landfill. Non-expendable gear (submersible pumps, hoses, boots, rope, and down-rigger) was thoroughly steam-cleaned between sample locations.

5.0 GEOPHYSICAL DATA INTERPRETATION

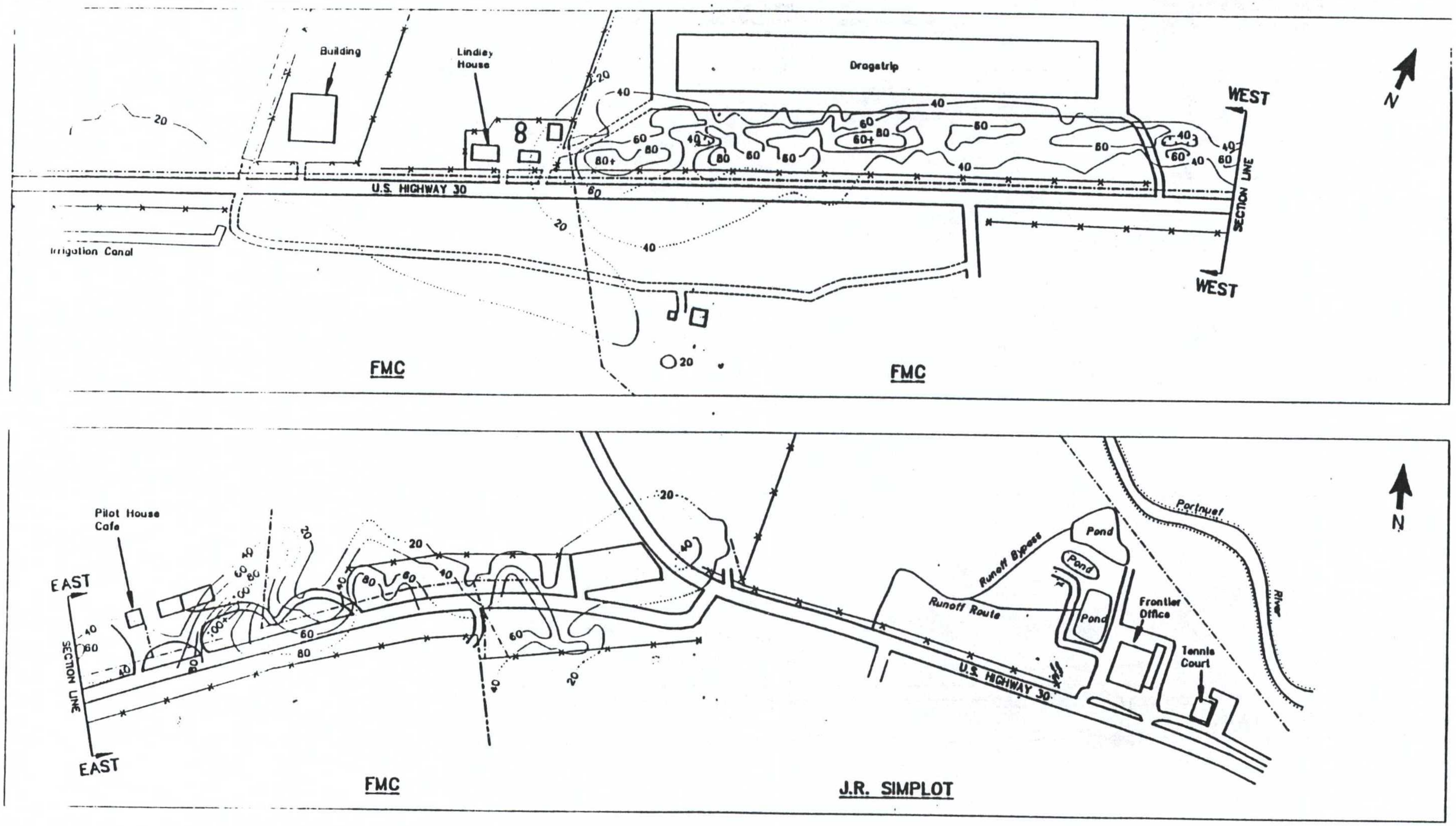
During performance of the EM34-3 surveys, a background grid was investigated west of the site to characterize natural terrain conductance. The background values were then compared to the conductivity readings obtained from areas reportedly hydraulically downgradient of potential contaminant sources. Downgradient readings exceeding average background readings by a factor of three or more were considered potentially significant. Table 10 summarizes the background ranges and averages for each of the different depths investigated with the EM34-3.

TABLE 10

EM34-3 BACKGROUND DATA SUMMARY

Depth	Dipole	# Readings	Average mmhos/m	Range mmhos/m
7.5 meters	Horizontal	20	21.8	13.0 - 30.0
15 meters	Vertical	20	12.5	6.0 - 21.0
15 meters	Horizontal	10	19.5	15.0 - 22.0
30 meters	Vertical	10	15.8	6.0 - 23.0

To facilitate visual interpretation of potential anomalous terrain conductivities, the geophysical data were plotted on a map and contour lines were drawn to represent the terrain conductivity in millimhos per meter. As indicated in Figures 11, 12, 13, and 14, a number of isolated anomalies were identified by the EM survey in the field south of the drag strip (i.e., Grid C, Figure 8). In the middle of grid C a strong signal was detected by the EM34-3 at all three depths (7.5, 15 and 30 meters). This elongated anomaly may indicate a buried metal tank or some type of large metallic object (Figures 11, 12, 13, 14). In that the drag strip was previously used as a municipal airport, this anomaly may represent an underground fuel storage tank. Comparison of Figures



LEGEND

Property-line
Fence
Power line
Terrain conductivity contour line (known)
Terrain conductivity contour line (estimated)

0 300 600 900 1200
scale in feet

0 1/8 1/4
scale in miles
contour interval = 20 millimhos/meter

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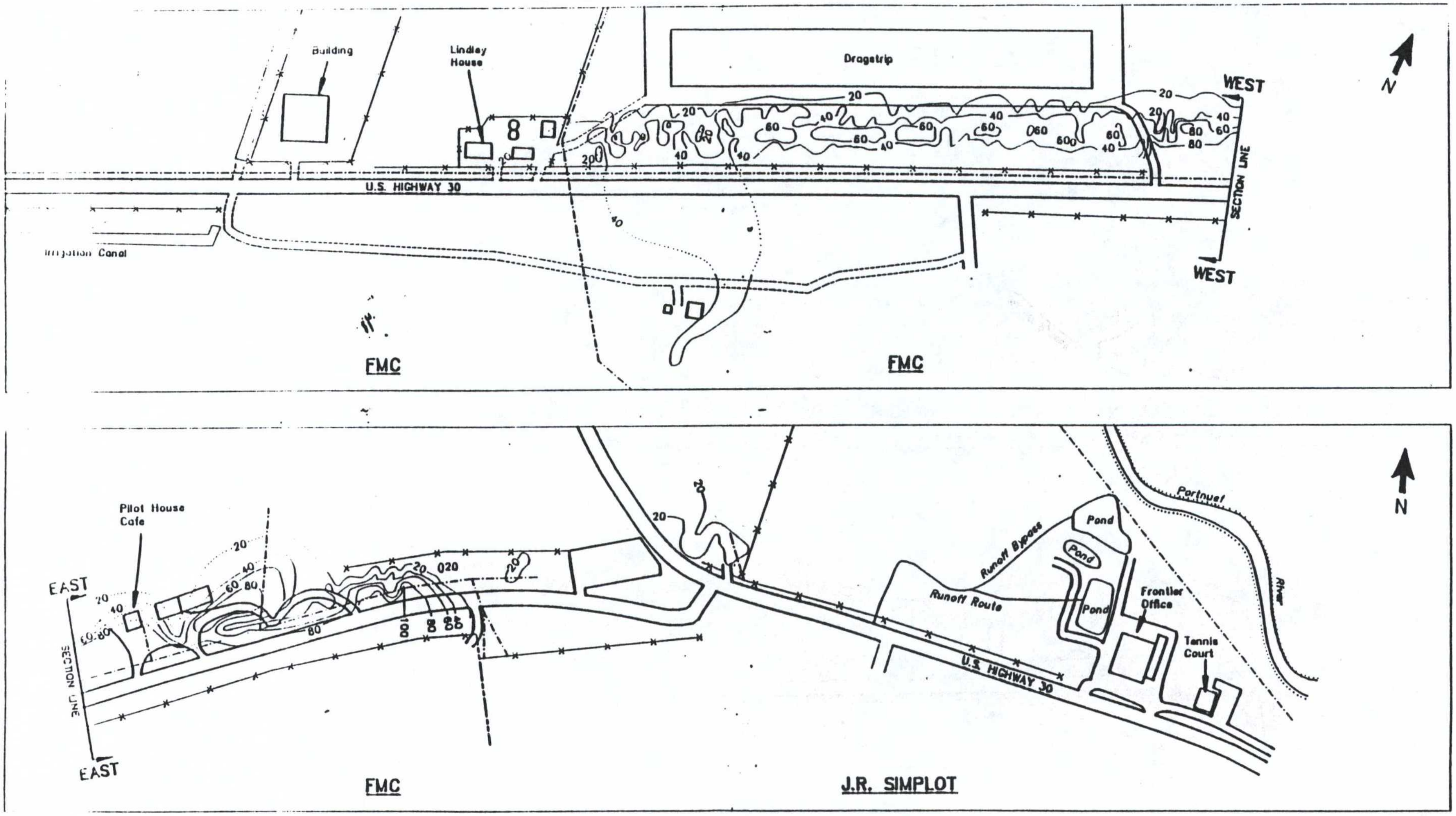
FIGURE 11
EM34-3, 7.5 METER DEPTH WITH HORIZONTAL DIPOLE
FMC/J.R. SIMPLOT SITES
Pocatello, ID



LEGEND

- Property-line
- Fence
- Power line
- Terrain conductivity contour line (known)
- Terrain conductivity contour line (estimated)

0 300 600 900 1200

scale in feet

0 1/8 1/4

scale in miles

contour interval = 20 millimhos/meter

ecology & environment, inc.	
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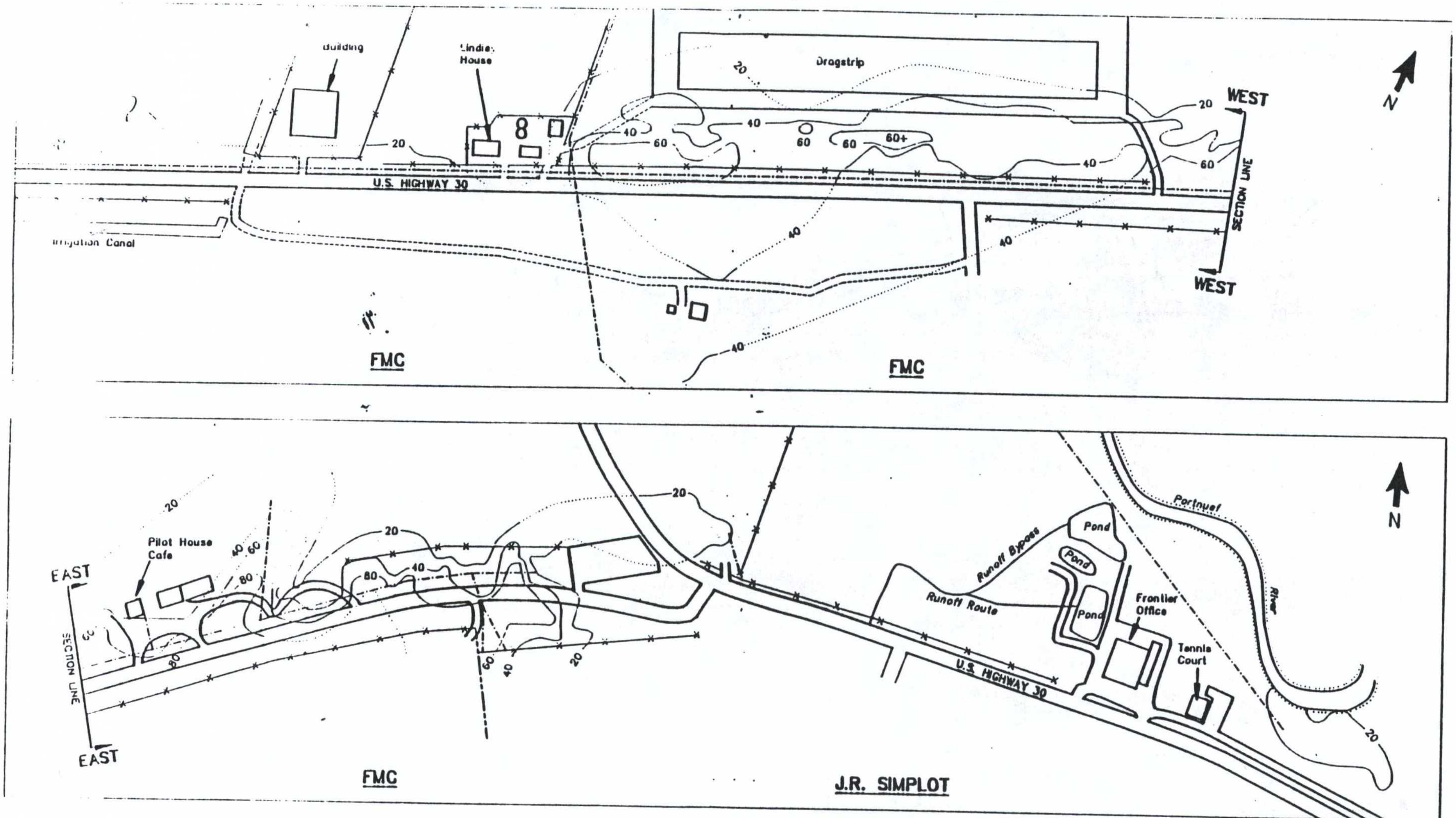
Drawn by: D. P.	Date: March 16, 1988

FIGURE 12
EM34-3, 15 METER DEPTH WITH VERTICAL DIPOLE
FMC/J.R. SIMPLOT SITES
Pocatello, ID



LEGEND

Property line
Fence
Power line
Terrain conductivity contour line (known)
Terrain conductivity contour line (estimated)

0 300 600 900 1200
scale in feet

0 1/8 1/4
scale in miles

contour interval = 20 millimhos/meter

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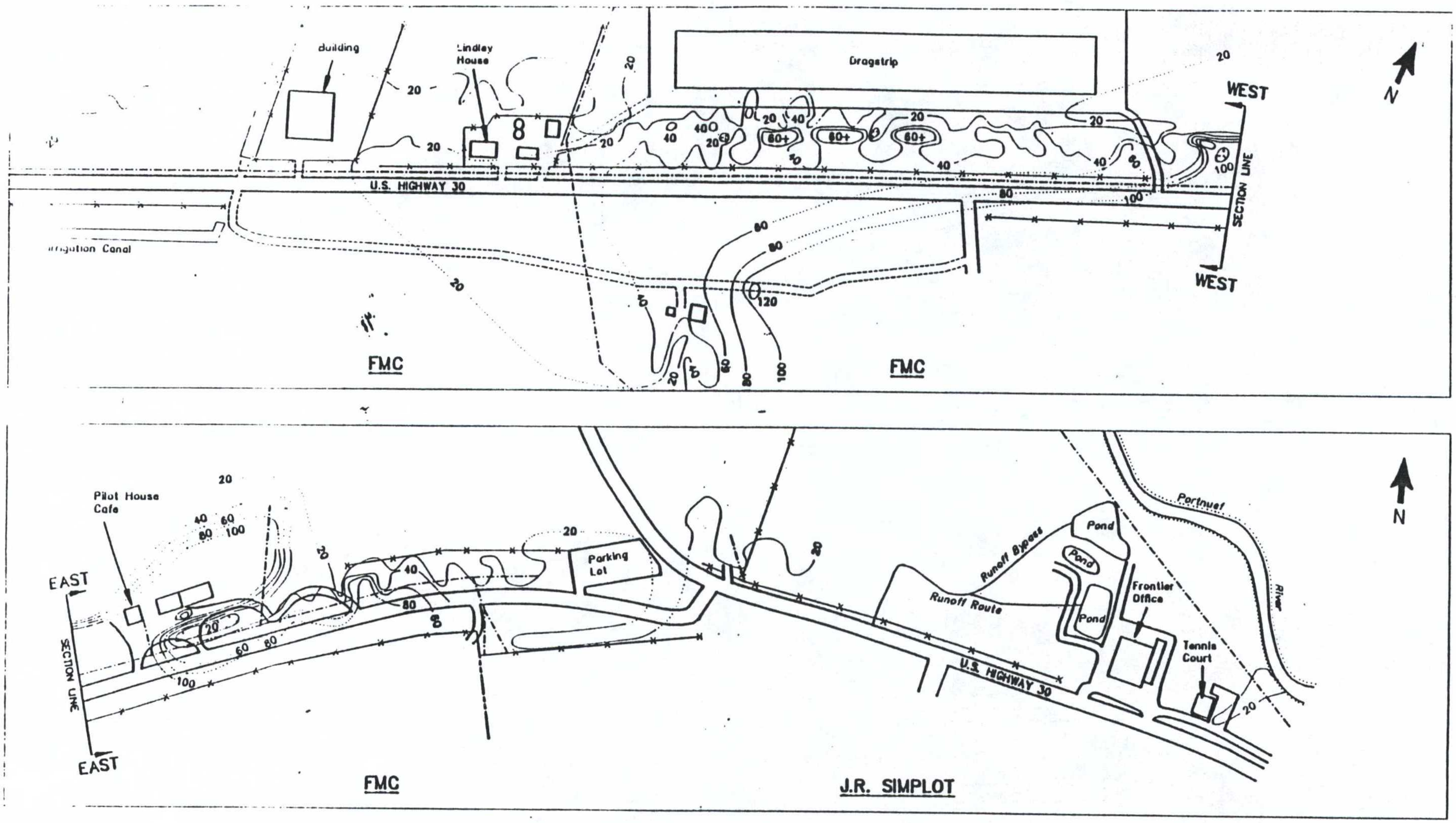
Job: F10-8702-9/10	Waste Site: ID0005/7
Drawn by: D. P.	Date: March 17, 1988

FIGURE 13
EM34-3, 15 METER DEPTH WITH HORIZONTAL DEPTH
FMC/J.R. SIMPLOT SITES
Pocatello, ID



LEGEND

Property line

Fence

Power line

Terrain conductivity contour line (known)

Terrain conductivity contour line (estimated)

0 300 600 900 1200

scale in feet

0 1/8 1/4

scale in miles

contour interval = 20 millimhos/meter

ecology & environment, inc.	
Job: F10-8702-9/10	Waste Site: ID0005/7
Drawn by: D. P.	Date: March 17, 1988

FIGURE 14
EM34-3, 30 METER DEPTH
WITH VERTICAL DIPOLE
FMC/J.R. SIMPLOT SITES
Pocatello, ID

12 and 14 to Figures 11 and 13 suggests the other small isolated anomalies in the field south of the drag strip are apparent only in the vertical dipole configuration (Figures 12, 14). The vertical dipole is more sensitive than the horizontal dipole to variations in the subsurface strata. Therefore, these small isolated anomalies are believed to represent local variations in the subsurface clay content or clay layer thickness. It does not appear that these localized anomalies indicate ground water contamination.

In addition to the isolated anomalies identified south of the drag strip, a large anomaly was detected in the vicinity of the Pilot House Cafe. The anomaly was detected at all depths utilized in the EM survey (Figures 11, 12, 13, 14). It appears that the anomaly generally increases in size and strength as the exploration depth increases from 7.5 meters to 30 meters. The anomaly extends east and west from the Pilot House Cafe incorporating parts of grids C, D, E and F (Figure 8). EM readings at 30 meters in depth seem to indicate that the anomaly in the Pilot House Cafe area extends southwest to the FMC grid. The size and orientation of this anomaly suggests it may be indicative of contamination in the unconfined aquifer with the same source potentially located on the FMC facility (Figure 12).

A number of variables may interfere with the EM data, reducing its interpretative quality. Some of the natural variables include: 1) changes in depth to ground water, 2) topographic changes, 3) changes in clay content, and 4) lithologic variations (19). Cultural sources of interference include power lines, pipelines, railroad tracks, fences, metallic refuse and buildings. In order to attribute the anomaly in the vicinity of the Pilot House Cafe to the migration of metals contamination in the ground water it has to be shown that the cultural and natural interferences on the EM data are minimal.

Theoretically, terrain conductivity is inversely related to ground water depth (i.e., conductivity values tend to increase with a decrease in depth to ground water) (19). As indicated in Figure 4, there is little variation in depth to ground water in the unconfined aquifer. Therefore, changes in depth to ground water are believed to have minimal influence on the EM data.

According to the 7.5 Minute U.S.G.S. Topographic maps, the total relief of the EM survey area is approximately 10 to 15 feet (1). This relatively minor relief is also believed to have minimal influence on the EM data.

Changes in clay content and clay layer thickness may affect EM data with increases in terrain conductivity values corresponding to an increase in clay content thickness. Figure 4 indicates the presence of the American Falls Lake Formation throughout the survey area. EM contours in Figures 11, 12, 13, and 14 do not correspond to clay thickness changes. Rather, conductivity increases in the vicinity of the Pilot House Cafe while the apparent clay layer thickness decreases. Clay content and lithologic variations are, therefore, not considered to be potential interference factors.

Cultural interferences (i.e., pipelines, power lines, fences and buildings) on the EM data were minimized by establishing the grid lines at sufficient distances away from the interference sources. The EM31 was utilized to determine the interference boundaries of an underground sprinkler system, power lines and known pipes. Grids A and K were eliminated due to cultural interferences from a sprinkler system and an underground pipe, respectively. It appears that some of the values near the Pilot House Cafe may be elevated because of an unknown source of cultural interference. However, the Pilot House Cafe anomaly also incorporated parts of grids C, E, F and the FMC grid where cultural interference is believed minimal.

Although cultural sources interfered with parts of the EM survey data, the size, shape and pattern of the Pilot House Cafe area anomaly indicates a potential contaminant plume migrating northeast in the unconfined aquifer. The exploration depths used in the EM survey (up to 30 meters) were not deep enough to penetrate the American Falls Formation and are, therefore, only indicative of the unconfined aquifer (Figure 4). Verification of the EM data with monitoring well sample data was not possible in that most of the monitoring wells installed by FMC (all except wells 11 and 12) are screened in the confined aquifer (Figure 6).

6.0 SAMPLE RESULTS AND DISCUSSION

6.1 Sample Data

All analytical data were delivered to E&E by February 18, 1988. Analyses for all TCL inorganics and organics were conducted through the EPA Contract Laboratory Program (CLP). Analyses for all other inorganics (total phosphorous, fluoride, chloride, and silica) were conducted by the EPA Region X Laboratory located in Manchester, Washington. All quality assurance information and complete data packages are included in Appendix D. Sample documentation information is included in Appendix E.

6.2 Data Evaluation

As previously mentioned, the primary objectives for collecting samples at the FMC and Simplot sites were to: 1) identify potential sources at one or both facilities which may be contaminating the unconfined aquifer and possibly the confined aquifer; 2) evaluate the magnitude of ground water contamination in the area; and 3) determine whether further study is warranted at one or both facilities. For the purposes of this report, "elevated" levels of contaminants in the environment are defined to exist when concentrations are either ten times greater than background levels or three times greater than the respective analytes' detection limit.

6.2.1 Organics Data

Water samples from five domestic wells, six production wells, and the one Batiste Spring were analyzed for the complete EPA TCL organics fraction (i.e., volatile and semi-volatile organics and pesticides). Table 11 summarizes those compounds detected in the well and spring samples. The organic data indicate that the shallow Pilot House Cafe well contains estimated concentrations of trichloroethene at 2.6 ug/l, 1,1,1-trichloroethane at 2.7 ug/l, 1,1-dichloroethane at 2.3 ug/l, 1,1-dichloroethene at 0.8 ug/l, chloroform at 0.7 ug/l, bis(2-ethylhexyl) phthalate at 3.5 ug/l, and di-n-octylphthalate at 0.5 ug/l. The Frontier Office well contains an estimated concentration of tetrachloroethene at 1.6 ug/l. Phenol was detected in estimated concentrations of 2.4 ug/l, 2.6 ug/l, and 5.8 ug/l in the Frontier, Shallow Pilot House, and Idaho Power Well samples, respectively. However, phenol was also detected at an estimated concentration of 3.1 ug/l in the blank sample, indicating probable bottle contamination. The organic compounds detected in the water samples are estimated because the concentrations rreported were less than Contract Required Detection Limit (CRDL).

Trichloroethene, tetrachloroethene, and 1,1-dichloroethene are primarily used in dry cleaning operations, metal degreasing, as a solvent for fats, greases, waxes, and for dyeing (22). These organic compounds are also utilized as refrigerants and heat transfer media (22). 1,1,1-Trichloroethane and 1,1-dichloroethane are solvents with a variety of uses. Chloroform is used in plastics, and as fluorocarbon refrigerants and propellants (22). Di-n-octylphthalate and bis(2-ethylhexyl)phthalate are plasticizers (22).

Under the Safe Drinking Water Act (40 CFR 141), Maximum Contaminant Levels (MCL) exist for three of the organic compounds detected in the Pilot House (shallow) and Frontier Office wells (Table 11). MCLs represent the allowable lifetime exposure to the contaminant for a 70 kg adult who is assumed to ingest two liters of water per day (23).

The Frontier Office well is utilized by J.R. Simplot employees for drinking purposes. However, the shallow Pilot House Cafe well has been abandoned since 1976 when it was condemned for high arsenic levels (18). The sources for the organics contamination of these two wells are unknown.

6.2.2 Inorganics Waste Pond, Waste Pile, and Soil Data

A total of 14 (seven water and seven sediment) waste pond, two waste pile, and two soil samples were collected from the FMC facility. Table 12 summarizes data for all sediment, waste and soil samples. Sediment, wastes, and soil samples were compared to the background soil sample to determine which ponds or waste piles have elevated levels of inorganics. The comparison of background soils to waste was made solely to identify elements or levels of elements which may not be found in natural conditions in this area. Table 13 summarizes inorganic compounds detected at elevated levels.

TABLE 11

SUMMARY OF ORGANIC COMPOUNDS DETECTED IN DOMESTIC WELLS (ug/l)

Compounds	Frontier Office Well	Pilot House Well (shallow)	Pilot House Well (deep)	Idaho Power Well	Water Blank	EPA Drinking Water Standards *
Phenol	2.4MJ	10.0U	2.6MJ	5.8J	3.1MJ	--
Toluene	5.0U	5.0U	5.0U	5.0U	1.5J	--
Trichloroethene	5.0U	2.6J	5.0U	5.0U	5.0U	5.0
Tetrachloroethene	1.6J	5.0U	5.0U	5.0U	5.0U	--
1,1,1-Trichloroethane	5.0U	2.7J	5.0U	5.0U	5.0U	200.0
1,1-Dichloroethane	5.0U	2.3J	5.0U	5.0U	5.0U	--
1,1-Dichloroethene	5.0U	0.8J	5.0U	5.0U	5.0U	7.0
Chloroform	5.0U	0.7J	5.0U	5.0U	5.0U	--
Bis(2-Ethylhexyl) phthalate	10.0U	3.5J	10.0U	10.0U	10.0U	--
Di-n-octylphthalate	10.0U	0.5J	10.0U	10.0U	10.0U	--

U - The material was analyzed for, but was not detected. The associated numerical value is an estimated sample detection limit.

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than Contract required detection limit (CRDL).

M - Mass spectral criteria for positive identification were not met. However, in the opinion of the laboratory, the identification is correct based on the analysts' professional judgement.

* - National Primary Drinking Water Regulations, Maximum Contaminant Level (40 CFR, Part 141).

TABLE 12

SUMMARY OF INORGANIC ELEMENTS DETECTED IN FMC WASTE POND SEDIMENT, WASTE PILES, AND SOILS (mg/kg)

Compounds	Slag Pond	Rainwater Pond	Calciner Pond	Cooling Pond	Pond 9S	Pond 4E	Pond 1E	Ferrophos Pile	Slag Pile	Ferrophos Soil	BKG Soil
Aluminum	11699	12452	23583	9265	16900	13413	14418	226.0	20136	7881	8737
Antimony	124.0J	115U	111U	91U	86U	76.0J	67.0J	6.0U	61U	62U	61U
Arsenic	25.7	32.3	9.3U	16.4J	21.5	19.0J	15.1J	5U	5.1U	5.2U	5.1U
Barium	134.0J	162.0J	340.0J	295.0	144.0J	141.0J	136.0J	4.0J	193.0J	131.0J	132.0J
Beryllium	2.9U	3.8U	3.7U	8.0U	2.9J	2.3J	2.1U	1.0J	2.5J	2.1U	1.0J
Cadmium	3384.6	224.0	210.2	297.0	6297.1	4340	4406.2	1.2U	16.7J	12U	1.2U
Calcium	129779	160385	233796	177121	106214	89800	133866	3027	267020	46418	35258
Chromium	238.0	786.0	1082	464.0	276.0	173.0J	443.0	4550	191.0	11U	14.0J
Cobalt	46U	9.0J	57U	47U	44U	36U	32U	25.0J	13U	32U	5.0
Copper	49.0J	128.0	78.0J	2299	226.0J	144.0J	130.0J	843.0	13U	13U	6.0J
Iron	2740	13231	13648	14667	3196	4110	6026	67500	852.0	11304	11702
Lead	529.0J	27.8J	194.0J	34.9J	1114J	772.0J	534.0J	2.5UJ	4.3J	8.4J	12.3J
Magnesium	2423J	3630J	3121J	2160J	5090J	8080J	2840J	11.0J	3468J	12711J	12747J
Manganese	112.0	192.0	32.0J	693.0	221.0	299.0	189.0	444.0	162.0J	377.0	437.0
Mercury	0.15U	0.32	15.7	2.3	0.3	0.12U	0.1U	0.1U	0.1U	0.1U	0.1U
Nickel	12U	153U	148U	121U	114U	93U	82U	1259	80U	82U	8U
Potassium	29882J	5279J	114444	5373J	64321	64100	38871J	1391J	6121J	3970J	3359J
Selenium	19.1J	12.9J	396.3J	3.8UJ	59.1J	59.0J	33.7J	2.5UJ	5.0J	2.6UJ	2.5UJ
Silver	52.9J	41.3J	156.5	34.8J	105.7	92.0	72.7J	61.5	26.3J	19.6J	18.2J
Sodium	4404J	1757J	5107J	1763J	5079J	9506J	3844J	68.0J	2560J	211.0J	175.0J
Thallium	45.0	10U	10.0	8U	111.0	73.0	60.0	50U	5U	5U	5U
Tin	73U	96U	93U	76U	71U	59.0J	84.0J	5U	51U	52U	72.0J
Vanadium	184.6J	1075	811.1	554.5	177.9J	122.0J	446.4J	4707.5	196.5J	36.6J	40.0J
Zinc	42037J	2819J	1293J	2008J	100929J	79420J	49443J	118.0J	428.0J	155.0J	95.0J
Fluoride	7960	6310	201450	7580	16940	35440	19130	375	4860	228	177
Silica	1530	575	2720	336	666	587	423	42.6	361	120	235
Chloride	217	14.1	169	71.4	335	2100	33.2	1.3	37.8	43.1	0.67

U - The material was analyzed for, but was not detected. The associated numerical value is an estimated sample detection limit.

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.

TABLE 13

SUMMARY OF ELEVATED INORGANIC ELEMENTS DETECTED IN
FMC WASTE POND SEDIMENT, WASTE PILES, AND SOIL
(mg/kg)

Compounds	Slag Pond	Rainwater Pond	Calciner Pond	Cooling Pond	Pond 9S	Pond 4E	Pond 1E	Ferrophos Pile	Slag Pile	Ferrophos Soil
Arsenic	25.7	32.3	---	16.4J	21.5	19.0J	---	---	---	---
Cadmium	3384.6	224.0	210.2	297.0	6297.1	4340	4406.2	---	16.7J	---
Chromium	238.0	786.0	1082	464.0	276.0	173.0J	443.0	4550	191.0	---
Copper	---	128.0	78.0J	2299	226.0J	144.0J	130.0J	843.0	---	---
Lead	529.0J	---	194.0J	---	1114J	772.0J	534.0J	---	---	---
Nickel	---	---	---	---	---	---	---	1259	---	---
Potassium	---	---	114444	---	64321	64100	38871J	---	---	---
Selenium	19.1J	12.9J	396.3J	---	59.1J	59.0J	33.7J	---	---	---
Sodium	4404J	1757J	5107J	1763J	5079J	9506J	3844J	---	---	---
Thallium	45.0	---	---	---	111.0	73.0	60.0	---	---	---
Vanadium	---	1075	811.1	554.5	---	---	446.4J	4707.5	---	---
Zinc	42037J	2819J	1293J	2008J	100929J	79420J	49443J	---	---	---
Fluoride	7960	6310	201450	7580	16940	35440	19130	---	4860	---
Silica	---	---	2720	---	---	---	---	---	---	---
Chloride	217	14.1	169	71.4	335	2100	33.2	---	37.8	43.1

U - The material was analyzed for, but was not detected. The associated numerical value is an estimated sample detection limit.

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.

TABLE 14

SUMMARY OF INORGANIC ELEMENTS DETECTED IN FMC WASTE POND WATER (mg/l)

Compounds	Slag Pond	Rainwater Pond	Calciner Pond	Cooling Pond	Pond 8S	Pond 8E	Pond 13S
Aluminum	755.5	1.7	4.7	0.035J	2.0	18.6	2.9
Antimony	0.012U	0.012U	0.41	0.012U	1.46	3.2	0.90
Arsenic	0.119J	0.024J	0.74J	0.01U	0.05U	0.14	0.05U
Barium	6.61	0.083J	0.031J	0.095J	0.016J	0.78J	0.04J
Beryllium	0.096	0.0004U	0.009	0.0004U	0.017	0.05	0.009J
Cadmium	19.07	0.052	2.8	0.0024U	0.89	8.87	1.13
Calcium	903.2	82.1	88.4	61.8	43.3	465.4	46.7J
Chromium	3.54	0.041	1.8	0.006J	0.72	1.9	0.38
Cobalt	0.013J	0.007J	0.04J	0.011J	0.011J	0.062U	0.062U
Copper	0.008J	0.036J	0.11J	0.024J	0.062UJ	0.096J	0.026UJ
Iron	35.2	1.75	19.5	0.17	4.15	8.4	2.09
Lead	2.91	0.012J	0.029J		0.29	0.91	0.22J
Magnesium	146.7	15.7	30.7	19.6	9.8	24.8J	6.7J
Manganese	4.44	0.042	0.71	0.024	0.37	1.2	0.16
Mercury	0.0008	0.0002U	0.0002U	0.0002U	0.0002U	0.0002U	0.0002U
Nickel	0.26	0.016U	1.13	0.016U	0.16U	0.16U	0.16U
Potassium	9464	32.05	802.1	7.7	4493	10880	3194
Selenium	0.1U	0.025U	1.9	0.005U	0.1U	0.25U	0.025U
Silver	0.068	0.003U	0.005J	0.003U	0.1	0.49	0.14
Sodium	1944	88.6	284.6	46.6	826.9	1642	547.6
Thallium	0.22	0.01U	0.53	0.01U	0.05U	0.05U	0.05U
Tin	0.21	0.019J	0.26J	0.01J	0.1U	0.1U	0.1U
Vanadium	2.58	0.20	2.1	0.005J	0.48J	1.09	0.25J
Zinc	0.005J	0.56	31.8	0.021	14.2	702.4	74.6
Fluoride	2850	5.9	525	0.87	700	2200	580
Silica	103	54.0	NA	46.0	NA	NA	145
Total Phosphorous	8400	13.6	910	0.87	2400	5700	1460
Chloride	485	70.0	311	69.2	508	880	292

U - The material was analyzed for, but was not detected. The associated numerical value is an estimated sample detection limit.

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.

R - Quality Control indicates that data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification.

NA - Compound was not analyzed for.

Table 14 summarizes data for all pond water samples. No comparison was made to any ground or surface water because these process waters should not be comparable. It should be noted that for certain ponds, many of the inorganic elements found elevated in the solid fractions were also found in the liquid fractions, (i.e., arsenic, cadmium, chromium, lead, potassium, selenium, thallium, vanadium, zinc, fluoride, silica, and chloride).

A total of seven water and six sediment samples were collected from one waste pond, three treatment ponds, one waste (gypsum slurry), one runoff ditch, and one waste pile from the Simplot facility. Table 15 summarizes data for all sediment and waste pile samples plus the corresponding concentrations found in the background soil sample previously included in Table 12. The background soil sample taken was assumed to be representative of the soils throughout the area. The comparison of the background soils to waste was made solely to identify elements or levels of elements which may not be found in natural conditions in this area. Table 16 summarizes inorganic compounds detected at elevated levels.

Table 17 summarizes data for all pond, waste and runoff water samples. No comparison was made to any ground or surface water because these process waters should not be comparable. It should be noted that, for certain ponds, many of the inorganic elements found elevated in the solid fractions were also found in the liquid fractions (i.e., cadmium, chromium, copper, sodium, fluoride, silica, and chloride).

6.2.3 Inorganics Ground Water Data

A total of 24 wells (six production, 13 monitoring, and five domestic) and one spring were sampled to assess the extent of possible ground water contamination downgradient of the FMC and Simplot facilities. As detailed in Section 2.3, only six of the wells sampled are screened in unconfined formations, specifically FMC 11, FMC 12, PEI 1, PEI 2, PEI 6, and IPW. Realizing the limitations, data from three wells were used to determine elevated levels of contaminants in wells downgradient of the various waste storage areas. FMC 10 was used as the background well for FMC monitoring wells (FMC 2-5, 7-9, 11, and 12). IPW was used as the background well for all domestic and production wells (Lindley; Pilot House - shallow and deep; Frontier; Batiste Springs; FMCP 1, 3, and 4; and SWP 4-6). PEI 6 was used as the background well for Simplot monitoring wells (PEI 1 and 2).

Table 18 summarizes the inorganic elements detected in the FMC and Simplot Monitoring wells. Table 19 summarizes the elevated inorganic elements detected in these wells. Elevated levels of arsenic, potassium, selenium, and silver were detected in several FMC monitoring wells. No elevated levels of any inorganic elements were detected in the Simplot monitoring wells.

Table 20 summarizes the inorganic elements detected in the domestic wells, FMC and Simplot production wells, and the Batiste Spring. Maximum Contaminant Levels (MCL), National Secondary Drinking Water Regulations, and a Guidance Level are included for health and aesthetic

TABLE 15

SUMMARY OF INORGANIC ELEMENTS DETECTED IN J.R. SIMPLOT WASTE POND AND DITCH SEDIMENT, WASTE PILE AND SOIL (mg/kg)

Compounds	Gypsum Decant	Gypsum Stack (0.6")	Gypsum Stack (2')	Gypsum Pond	East Overflow Pond	Runoff Ditch	BKG Soil
Aluminum	1281J	749.0	965.0J	4280	116.0U	6221	8737
Arsenic	10.0U	5.9U	6.5U	8.2U	16.7U	7.9	5.1U
Barium	77.0J	62.0J	64.0J	81.0J	37.0J	729.0J	132.0J
Cadmium	31.0J	14.0U	19.5J	20.0U	40.0U	38.1J	1.2U
Calcium	212700	250353	253766	198770	4763J	61111	35258
Chromium	56.0J	41.0J	31.0J	30.0J	115.0	718.0	14.0J
Copper	26.0U	6.0J	40.0U	21.0U	43.0U	113.0J	6.0J
Iron	659.0J	324.0J	375.0J	585.0J	787J	18230	11702
Lead	5.7J	5.6J	6.8J	5.7J	8.3UJ	104.8J	12.3J
Magnesium	160.0U	94.0U	10.0U	131.0U	145.0J	3363J	12747J
Manganese	5.0J	4.0J	5.0J	4.0J	6.7U	106J	437.0
Mercury	0.2U	0.1U	0.13U	0.16U	2.0	2.9	0.1U
Potassium	3260U	1920U	2120U	10607J	5430U	2590U	3359J
Selenium	25.0UJ	15.0UJ	16.0UJ	5.2J	64.2J	4.4J	2.5UJ
Silver	28.0U	16.0U	18.0U	23.0U	476.0U	31.8J	18.2J
Sodium	3725J	1066J	903	1718J	2132J	1090J	175.0J
Vanadium	81.0J	57.7J	39.0J	32.0J	70.0J	308.7J	40.0J
Zinc	190.0J	131.0J	128.0J	75.0J	92.0J	599.0J	95.0J
Fluoride	2890	7260	5130	60520	12250	4350	177
Silica	2180	1010	350	4710	14390	269	235
Chloride	57.4	5.4	14.1	27.8	319	106	0.67

U - The material was analyzed for, but was not detected. The associated numerical value is an estimated sample detection limit.

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.

TABLE 16

SUMMARY OF ELEVATED INORGANIC ELEMENTS DETECTED IN
J.R. SIMPLOT POND AND DITCH SEDIMENT AND WASTE PILE
(mg/kg)

Compounds	Gypsum Decant	Gypsum Stack (0.6")	Gypsum Stack (2')	Gypsum Pond	East Overflow Pond	Runoff Ditch
Cadmium	31.0J	---	---	---	---	38.1J
Chromium	---	---	---	---	---	718.0
Copper	---	---	---	---	---	113.0J
Mercury	---	---	---	---	2.0	2.9
Selenium	---	---	---	---	64.2J	---
Sodium	---	---	---	---	2132J	---
Fluoride	2890	7260	5130	60520	12250	4350
Silica	---	---	---	---	14390	---
Chloride	57.4	---	14.1	27.8	319	106

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.

TABLE 17

SUMMARY OF INORGANIC ELEMENTS DETECTED IN J.R. SIMPLOT WASTE POND, WASTE, AND RUNOFF WATER (mg/l)

Compounds	Gypsum Decant	Gypsum Pond	East Overflow Pond	Treatment Pond #1	Treatment Pond #2	Treatment Pond #3	Runoff Ditch
Aluminum	91.5	6.3	21.4	1.1	0.69	0.058	0.29
Antimony	0.12U	0.13	0.072	0.012U	0.012U	0.012U	0.012U
Arsenic	0.58	0.18J	0.15	0.05U	0.05U	0.05U	0.01U
Barium	1.11J	0.076J	0.19J	0.087J	0.082J	0.084J	0.079J
Beryllium	0.027J	0.031	0.005	0.0004U	0.0004U	0.0004U	0.0004U
Cadmium	1.87	7.9	0.23	0.015	0.005	0.007	0.004J
Calcium	1686J	1212	324.2	149.9	139.4	111.7	69.0
Chromium	5.19	9.1	1.6	0.64	0.35	0.51	0.58
Cobalt	0.062U	0.057	0.006U	0.006U	0.006U	0.006U	0.006U
Copper	2.35	13.6	0.059	0.014J	0.009J	0.008J	0.007J
Iron	40.7	20.2	127.6	1.4	0.61	0.65	0.55
Lead	0.042	0.015J	0.025J	0.013J	0.005J	0.005U	0.017J
Magnesium	88.2	124.2	32.7	41.2	39.9	31.1	19.7
Manganese	1.3	4.1	0.24	0.032	0.023	0.021	0.012J
Nickel	1.6J	3.6	0.43	0.022J	0.016U	0.016U	0.016U
Potassium	170.7	229.8	35.0	15.4	15.0	12.1	7.8
Selenium	0.07J	0.87J	0.025U	0.025U	0.025U	0.025U	0.005U
Silver	0.066J	0.024	0.003U	0.003J	0.005J	0.007J	0.008J
Sodium	879.5J	1283	92.2	439.1	1702	1709	92.5
Vanadium	14.2	24.8	2.7	0.096	0.098	0.077	0.05
Zinc	23.3	51.6	4.1	0.47	0.20	0.29	0.28
Fluoride	5350	1240	7800	5.1	4.6	4.1	3.05
Silica	2975	1125	5025	98.0	81.0	69.0	61.0
Total Phosphorous	1300	2680	540	15.5	11.8	10.8	4.3
Chloride	79.0	80.7	119	108	106	90.1	65.1

U - The material was analyzed for, but was not detected. The associated numerical value is an estimated sample detection limit.

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.

TABLE 18

SUMMARY OF INORGANIC ELEMENTS DETECTED IN MONITORING WELLS (mg/l)

	FMC Corporation										J.R. Simplot		
Compounds	FMC 2	FMC 3	FMC 4	FMC 5	FMC 7	FMC 8	FMC 9	FMC 10 (BKG)	FMC 11	FMC 12	PEI 6 (BKG)	PEI 1	PEI 2
Aluminum	0.15J	0.53	0.71	0.10J	0.07U	0.071J	0.16	13.1	0.088J	0.011J	0.07U	0.037J	0.13J
Arsenic	0.037J	0.016J	0.01U	0.057J	0.069	0.20J	0.023J	0.01U	0.01U	0.037J	0.01U	0.01U	0.01U
Barium	0.13J	0.048J	0.14J	0.19J	0.036J	0.058J	0.16J	0.44J	0.067J	0.031J	0.066J	0.14J	0.14J
Beryllium	0.0004U	0.0004U	0.0004U	0.004U	0.0004U	0.0004U	0.0004U	0.0016J	0.0004U	0.0004U	0.004U	0.0004U	0.0004J
Cadmium	0.003J	0.002U	0.003J	0.002J	0.024U	0.003J	0.003J	0.0035J	0.003U	0.002U	0.024U	0.002U	0.002U
Calcium	102.9	97.3	117.3	75.6	378.0	264.1	115.9	160.8	43.7	148.7	57.8	87.0	85.7
Chromium	0.007J	0.014	0.02	0.005J	0.022U	0.008J	0.008J	0.13	0.013	0.003J	0.022U	0.003J	0.008J
Cobalt	0.015J	0.032J	0.006U	0.014J	0.062U	0.008J	0.012J	0.009J	0.006U	0.006U	0.062U	0.006U	0.006U
Copper	0.018J	0.016J	0.28	0.35	0.026U	0.012J	0.051	0.17	0.03	0.003J	0.026UJ	0.008J	0.01J
Iron	8.8	2.8	25.2	17.5	37.8	24.1	20.6	39.7	37.1	22.1	0.079J	0.093J	0.26
Lead	0.014J	0.005UJ	0.01J	0.021J	0.005U	0.02J	0.014J	0.10J	0.045J	0.009J	0.008J	R	R
Magnesium	66.0	36.9	34.2	41.0	124.3	96.2	50.5	46.2	17.1	52.4	14.3J	31.8	31.4
Manganese	2.7	0.06	0.20	0.42	0.62	0.24	1.6	0.83	0.56	0.24	0.005J	0.003J	0.011J
Nickel	0.016U	0.016U	0.016U	0.016U	0.16UJ	0.016U	0.016U	0.073	0.016U	0.026J	0.16U	0.016U	0.016U
Potassium	67.5	13.2	9.4	159.0	29.2J	16.7	121.9	10.6	3.7J	13.0	7.6J	6.8	6.4
Selenium	0.005U	0.021	0.005U	0.005U	0.005U	0.052J	0.005U	0.005U	0.005U	0.007	0.005U	0.005U	0.005U
Silver	0.003U	0.003U	0.003U	0.003U	0.04J	0.003U	0.003U	0.003U	0.003U	0.003U	0.047J	0.003U	0.003U
Sodium	197.8	235.8	76.5	120.6	382.2J	280.7	128.4	45.8	40.2	107.9	13.4J	50.1	47.5
Tin	0.01U	0.01U	0.01U	0.011J	0.1U	0.01J	0.012J	0.01U	0.016J	0.011J	0.1U	0.01U	0.01U
Vanadium	0.005J	0.011J	0.012J	0.011J	0.042J	0.015J	0.012J	0.022J	0.012J	0.007J	0.047J	0.004U	0.004U
Zinc	0.068	0.021	0.16	0.17	0.062J	0.035	0.17	0.12	0.012	0.008J	0.54	0.015J	0.013J
Fluoride	0.28	0.42	0.67	0.09	0.34	0.52	0.02U	0.48	0.72	1.38	0.32	0.19	0.21
Silica	44.0	50.0	42.0	59.0	70.0	69.0	63.0	53.0	23.0	43.0	69.0	29.0	25.0
Total Phos.	7.0	4.4	0.36	8.1	9.6	23.5	3.2	3.0	0.27	7.6	0.1	0.06	0.08
Chloride	232	164	158	217	141	222	277	133	41.5	78.5	41.5	61.7	57.9

U - The material was analyzed for, but was not detected. The associated numerical value is an estimated sample detection limit.
J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.
R - Quality Control indicates that data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification.

TABLE 19

SUMMARY OF ELEVATED INORGANIC ELEMENTS DETECTED IN FMC MONITORING WELLS (mg/l)

Elements	FMC 2	FMC 3	FMC 5	FMC 7	FMC 8	FMC 9	FMC 12
Arsenic	0.037J	---	0.057J	0.069	0.20J	---	0.037J
Potassium	---	---	159.0	---	---	121.9	---
Selenium	---	0.021	---	---	0.052J	---	---
Silver	---	---	---	0.04J	---	---	---

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.

TABLE 20

SUMMARY OF INORGANIC ELEMENTS DETECTED IN DOMESTIC WELLS, PRODUCTION WELLS AND BATISTE SPRING (mg/l)

Elements	ID PWR (BKG)	FMC Corporation						J.R. Simplot				Batiste Spring	EPA Drinking Water Standard
		Lindley	Pilot-Sh	Pilot-Dp	FMCP 1	FMCP 3	FMCP 4	SWP 4	SWP 5	SWP 6	Frontier		
Aluminum	0.017J	0.007U	0.008J	0.007U	0.007U	0.007U	0.007U	0.007U	0.007U	0.007U	0.007U	0.02J	NSE
Arsenic	0.015J	0.01U	0.054J	0.01U	0.01U	0.012U	0.01U	0.01J	0.01U	0.023J	0.01U	0.038J	0.05*
Barium	0.036J	0.12J	0.25	0.072J	0.12J	0.077J	0.093J	0.066J	0.069J	0.031J	0.10J	0.038J	1.0*
Cadmium	0.002U	0.002U	0.002U	0.002U	0.016	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.002U	0.01*
Calcium	44.0	201.0	88.1	51.1	78.2	51.5	121.8	64.5	53.8	159.2	67.5	84.8	NSE
Chromium	0.003J	0.003J	0.002J	0.002U	0.002U	0.002J	0.004J	0.002U	0.003J	0.004J	0.002J	0.002U	0.05*
Cobalt	0.006U	0.006U	0.02J	0.006U	0.024J	0.006U	0.006U	0.006U	0.006U	0.006U	0.006U	0.006U	NSE
Copper	0.003U	0.74J	0.008J	0.003U	0.003U	0.003U	0.003J	0.003U	0.003U	0.003U	0.006J	0.003U	NSE
Iron	0.029J	0.13	0.27	0.072J	0.055J	0.038J	0.077J	0.085J	0.067J	0.09J	0.062J	0.021J	0.3**
Lead	R	0.023J	R	R	0.008J	0.005UJ	0.005UJ	0.005UJ	0.005UJ	0.005UJ	R	R	0.05*
Magnesium	15.6	78.1	50.4	15.9	250.2	15.0	35.8	17.8	16.0	42.9	23.4	30.0	NSE
Manganese	0.0004U	0.001J	0.98	0.001J	0.15	0.001J	0.014J	0.0004J	0.0004J	0.0004J	0.001J	0.012J	0.05*
Potassium	7.8	17.4	138.2	4.9	8.4	5.6	9.5	5.8	5.3	11.1	5.7	12.0	NSE
Selenium	0.005U	0.005U	0.005U	0.025U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.005U	0.008	0.01*
Silver	0.003U	0.003U	0.003U	0.003U	0.004J	0.003U	0.003J	0.003U	0.003U	0.005J	0.003U	0.003U	0.05*
Sodium	24.7	193.5	151.1	29.3	52.1	30.4	97.5	45.9	40.1	99.9	38.4	60.4	20.0***
Vanadium	0.011J	0.004U	0.01J	0.004U	0.008J	0.005J	0.008J	0.007J	0.006J	0.012J	0.004U	0.008J	NSE
Zinc	0.089	0.061	0.047	0.004J	0.15	0.003J	0.005J	0.003J	0.006J	0.003J	0.015J	0.007J	5.0**
Fluoride	0.41	0.44	0.02	0.84	0.37	0.81	0.58	0.91	0.96	0.68	0.51	0.48	4.0*(2.0**)
Silica	57.0	46.0	59.0	36.0	47.0	42.0	47.0	41.0	36.0	49.0	29.0	40.0	NSE
Total Phos.	0.05	0.07	11.5	0.01	0.62	0.06	0.22	0.37	0.08	1.5	0.04	2.6	NSE
Chloride	40.7	441	258	33.6	194	36.1	206	38.1	35.5	64.8	44.9	65.2	250.0**

U - The material was analyzed for, but was not detected. The associated numerical value is an estimated sample detection limit.
J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.
R - Quality Control indicates that data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification.
NSE - No Standard exists.
* - National Primary Drinking Water Regulations, Maximum Contaminant Level (40 CFR, Part 141).
** - National Secondary Drinking Water Regulations (40 CFR, Part 143). These regulations are set for taste, color, odor, and other aesthetic considerations which are not health related.
*** - Guidance Level for persons with a genetic predisposition to hypertension, hypertensive patients, pregnant women, and others on sodium restrictive diets.

TABLE 21

SUMMARY OF ELEVATED INORGANIC ELEMENTS DETECTED IN DOMESTIC WELLS, PRODUCTION WELLS, AND BATISTE SPRING (mg/l)

Elements	ID PWR (BKG)	FMC Corporation						J.R. Simplot				Batiste Spring
		Lindley	Pilot-Sh	Pilot-Dp	FMCP 1	FMCP 3	FMCP 4	SWP 4	SWP 5	SWP 6	Frontier	
Cadmium	---	---	---	---	0.016	---	---	---	---	---	---	---
Cobalt	---	---	0.02J	---	0.024J	---	---	---	---	---	---	---
Copper	---	0.74J	---	---	---	---	---	---	---	---	---	---
Magnesium	---	---	---	---	250.2	---	---	---	---	---	---	---
Manganese	---	---	0.98	---	0.15	---	0.014J	---	---	---	---	0.012J
Potassium	---	---	138.2	---	---	---	---	---	---	---	---	---
Total Phos	---	---	11.5	---	0.62	---	---	---	---	1.5	---	2.6
Chloride	---	441	---	---	---	---	---	---	---	---	---	---

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.

comparisons. Table 21 summarizes the elevated inorganic compounds detected in these wells and spring. Elevated levels of cadmium, cobalt, copper, magnesium, manganese, potassium, total phosphorous, and chloride were detected in several wells and the spring.

Table 22 summarizes the inorganic elements detected in the water and rinsate blanks collected during the sampling effort. The elements and levels detected in these blanks do not affect the data and conclusions presented in this report.

7.0 CONCLUSIONS

It is apparent from the analytical data that both the unconfined and confined aquifers are contaminated with toxic metals. The EM survey identified a potential contaminant plume in the unconfined aquifer. Possible sources of ground water contamination are the FMC unlined waste ponds (i.e., 1E, 4E, 8S, slag pond, calciner pond, rainwater lagoon and cooling pond). The unlined ponds most likely to be releasing a majority of contaminants to the ground water are the slag pond, calciner pond, cooling pond and rainwater lagoon, which contain water for most of the year. The previous unlined slurry ponds (1E, 4E and 9S) are no longer in use and do not contain water except during periods of precipitation. Since no elevated levels of inorganic elements were detected in the Simplot downgradient monitoring wells, the apparent ground water contamination does not appear to be caused by Simplot waste management practices. The number of wells screened in the unconfined aquifer are not sufficient to determine the magnitude or extent of the apparent contamination. One of the four downgradient wells screened in the unconfined aquifer indicated elevated levels of arsenic. The EM survey appears to delineate a contaminant plume extending northeast from the FMC facility. The elevated level of arsenic combined with the EM survey results are indicative of metals contamination in the unconfined aquifer.

The majority of the monitoring wells, domestic, and production wells are screened below the confining clay layer (Figures 4 and 6). The analytical data from these wells indicate the release of certain elements to the confined aquifer as summarized in Table 21.

A number of different factors appear to indicate that the ground water contamination in both aquifers is concentrated in the northeast area of the FMC facility. The elevated levels of arsenic and other metals in FMC monitoring wells 2, 5, 7, 8, and 12 delineate an area of contamination in the northeastern vicinity of the FMC site. The EM survey results indicated a potential plume extending northeast from the FMC facility, and the unlined FMC waste ponds containing water are clustered in the northeastern section of the FMC site.

The contamination in and apparently emanating from the FMC unlined waste ponds present a number of potential health hazards. Table 23 summarizes the EPA Drinking Water Standards being exceeded. The shallow Pilot House well is not utilized for drinking purposes at this time.

TABLE 22

SUMMARY OF INORGANIC ELEMENTS DETECTED IN QA/QC SAMPLES (ug/l)

Elements	Water Blank #1	Water Blank #2	Water Blank #3	Bailer Rinsate
Aluminum	18.0	27.0J	70U	99.0J
Barium	2.0J	2.0J	16U	6.0
Beryllium	0.6J	0.9J	4.0U	4.0U
Calcium	651J	160J	338J	245J
Copper	2.6UJ	6.0J	26U	26U
Iron	63.0J	31.0J	185J	45U
Magnesium	79.0J	69.0J	160U	160U
Manganese	1.0J	2.0J	4.0U	4.0U
Potassium	326U	354J	1,566J	3,260U
Silver	2.8U	4.4J	50.0	44.0J
Sodium	405J	496J	163J	349J
Zinc	8.0J	7.0J	17U	17U
Tin	10U	13.0J	10U	100U
Vanadium	4.2U	4.9J	43.0J	42U
Fluoride	0.02U	0.02U	0.02U	0.02U
Silica	1,000M	1,000M	1,000M	1,000M
Total Phosphorous	13.0	2.0U	4.Q	4.0
Chloride	210	100U	100U	100U

U - The material was analyzed for, but was not detected. The associated numerical value is an estimated sample quantitation limit.

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.

M - Mass spectral criteria for positive identification were not met. However, in the opinion of the laboratory, the identification is correct based on the analysts' professional judgement.

TABLE 23

SUMMARY OF ELEVATED INORGANIC ELEMENTS EXCEEDING EPA DRINKING WATER STANDARDS (mg/l)

	FMC Corporation						J.R. Simplot					
Elements	Lindley	Pilot-Sh	Pilot-Dp	FMCP 1	FMCP 3	FMCP 4	SWP 4	SWP 5	SWP 6	Frontier	Batiste Spring	EPA Drinking Water Standard
Arsenic	---	0.054J	---	---	---	---	---	---	---	---	---	0.05*
Cadmium	---	---	---	0.016	---	---	---	---	---	---	---	0.01*
Manganese	---	0.98	---	0.15	---	---	---	---	---	---	---	0.05**
Sodium	193.5	151.1	29.3	52.1	30.4	97.5	45.9	40.1	99.9	38.4	60.4	20.0***
Chloride	441	258	---	---	---	---	---	---	---	---	---	250.0**

J - The associated numerical value is an estimated quantity because quality control criteria were not met or concentrations reported were less than the CRDL.

* - National Primary Drinking Water Regulations, Maximum Contaminant Level (40 CFR, Part 141). These regulations are health based benchmarks.

** - National Secondary Drinking Water Regulations (40 CFR, Part 143). These regulations are set for taste, color, odor, and other aesthetic considerations which are not health related.

*** - Guidance Level for persons with a genetic predisposition to hypertension, hypertensive patients, pregnant women, and others on sodium restrictive diets.

Another potential health hazard exists from the dry contaminated sediment in ponds 1E, 4E and 8S. During dry summer months, wind-blown dust from these ponds may present an inhalation hazard to FMC and Simplot employees, as well as the surrounding population.

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